Vol. 25 DECEMBER, 1904 No. 148

THE FOUNDRY

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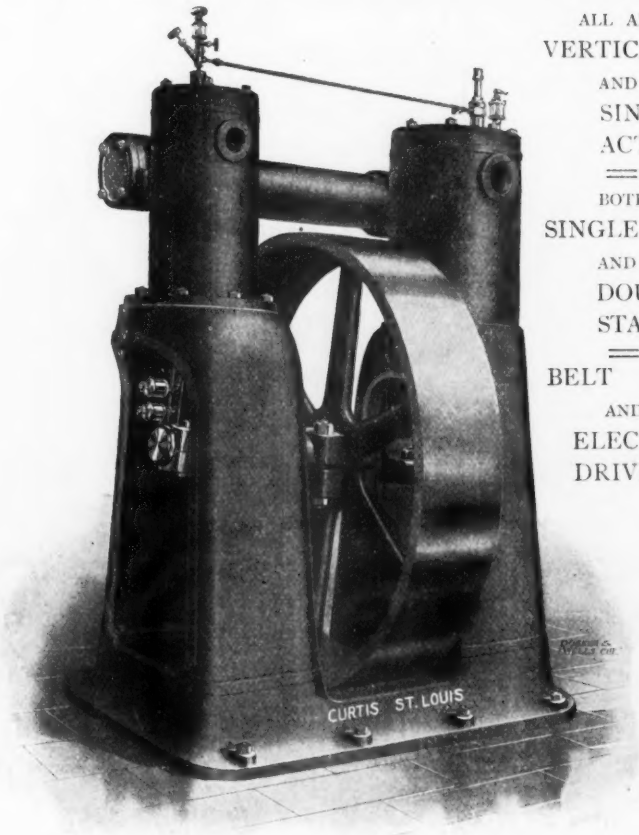

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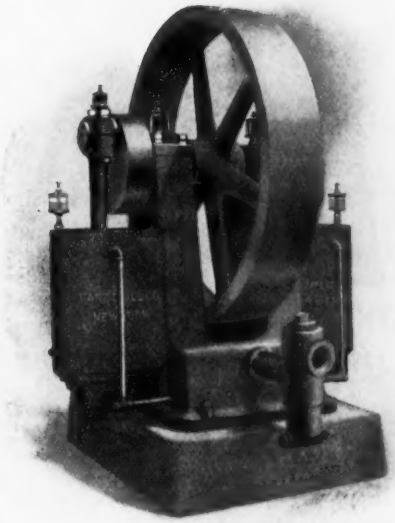

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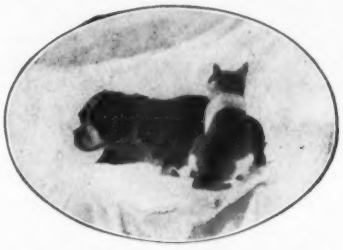

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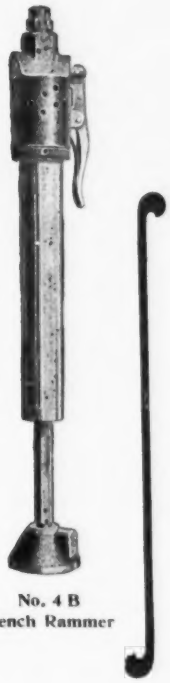

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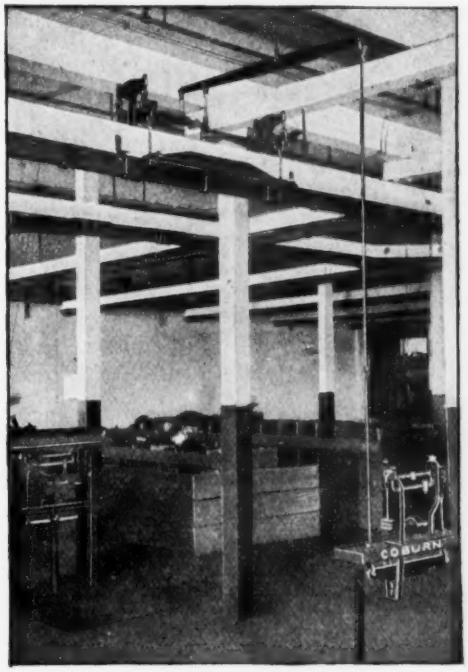

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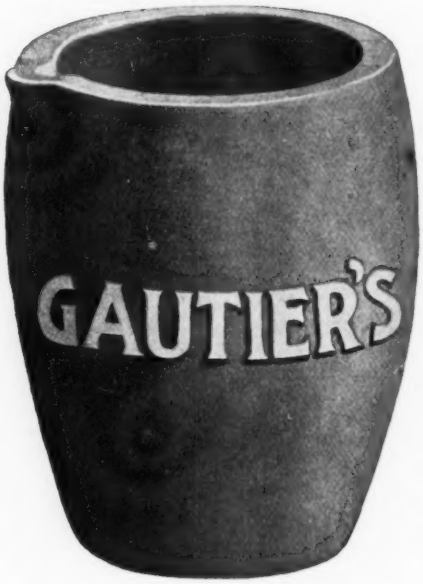

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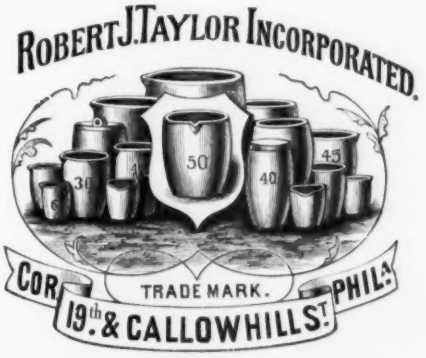

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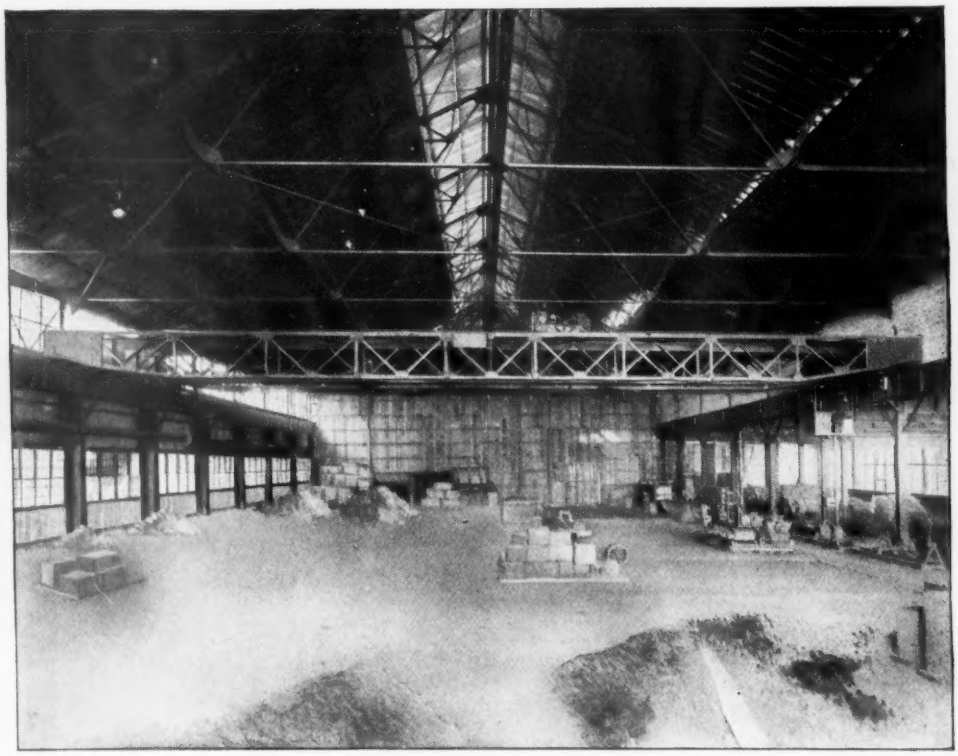

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THE FOUNDRY

Vol. 25, No. 4. *CLEVELAND, OHIO, DECEMBER, 1904.* *Whole No. 148*

Foundry of H. Bollinckx, Brussels, Belgium.

In *The Foundry* for March, 1898, we published an article describing in part the above mentioned plant. There are, however, a number of other points which we think would be of interest to Americans, and hence we are glad to publish the following concerning these world-famous works.

Many Americans are liable to think that our practice is the best in all particulars. As a consequence, there is danger that we will not turn our minds to the plants of our fellow-craftsmen in other countries to as great an extent as we should, or as they do. The extent to which some of the more advanced European foundries are made up of good points taken from all countries is well illustrated in the works under consideration.

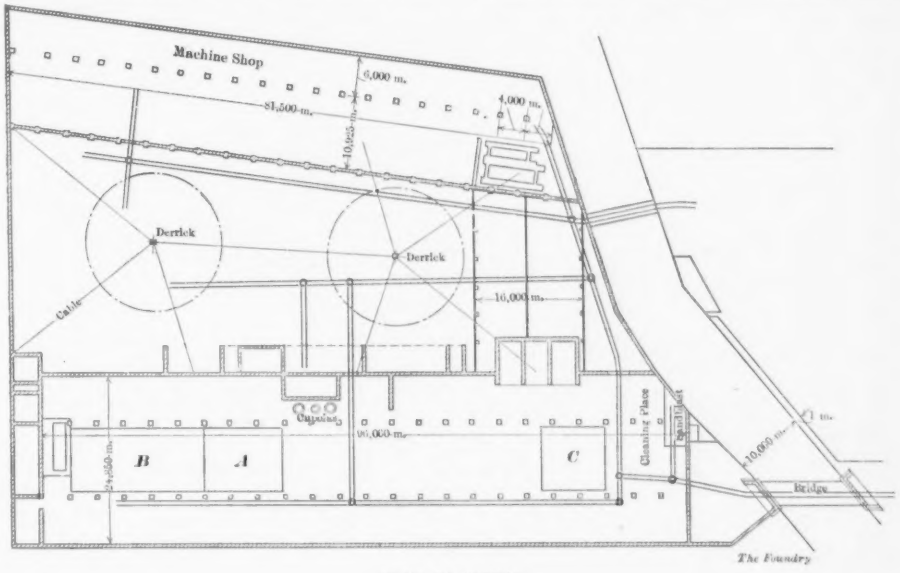
They have not only drawn upon their own country and Europe for the best practice available, but a considerable portion of their equipment and some of their methods of conducting their work were obtained from this country. The firm manufactures a line of machinery including fine Corliss engines and Riedler pumps. Their pattern shop is equipped with the usual woodworking tools, which include several American machines. One of the accompanying illustrations shows a general plan of the works. It will be noticed that the foundry is arranged on one side and the machine shop on the other. The yard is served both by industrial railway and by two large derricks.

Melting Equipment.

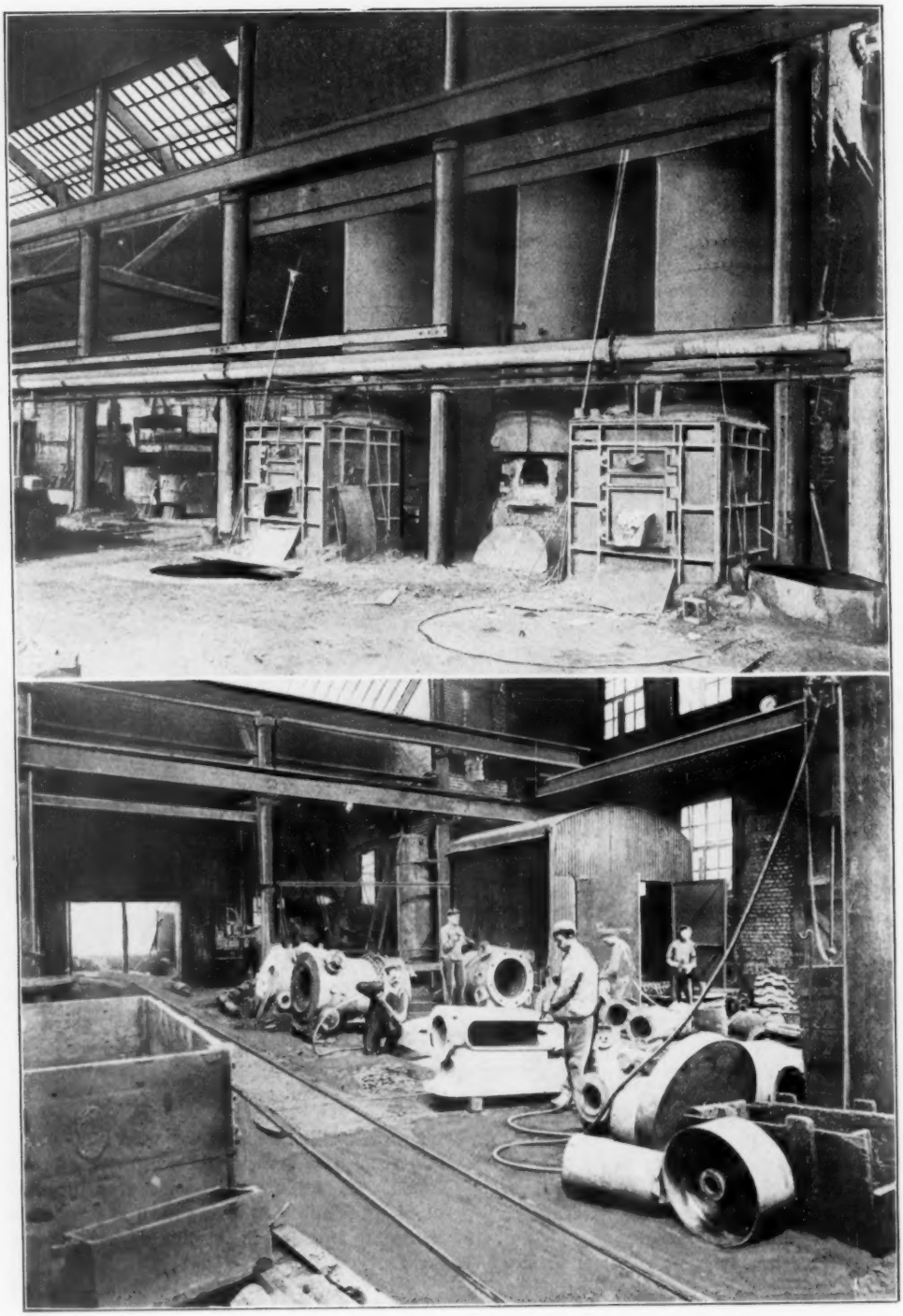
The iron and fuel are stored in the yard adjacent to the foundry, and are taken to the cupola platform by means of trucks and an elevator. Three cupolas are used and to the American foundryman these are of especial interest, on account of the fact that they are fitted with fore-hearths as shown in one of the halftones, and also in the line drawing of the cupola.

It will be noticed that the upper part of the cupola above the melting zone is considerably larger than the melting zone, the lining being contracted in the lower portion of the shaft.

An air belt extends around the shell and

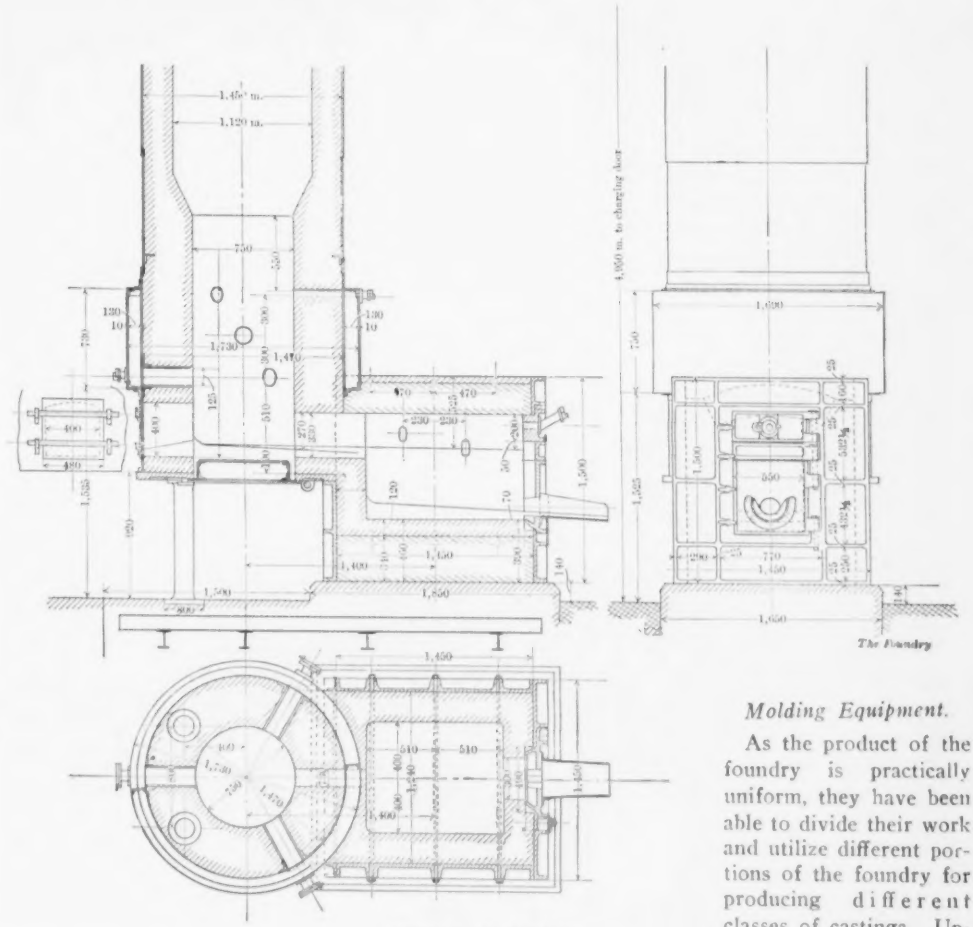


PLAN OF WORKS.



1. CUPOLAS WITH FORE-HEARTHS. 2. CLEANING DEPARTMENT.

the tuyeres are arranged in three rows at different heights. As fast as the iron is melted it drops to the sand bottom and flows into the fore-hearth or receiver, from which it is tapped as needed. Unlike many European cupolas, this one is provided with a drop bottom. In this respect it follows the American practice, but it will be noticed that the bottom door is made up of structural shapes and sheets, in place of being made from castings, as is the usual practice with us.



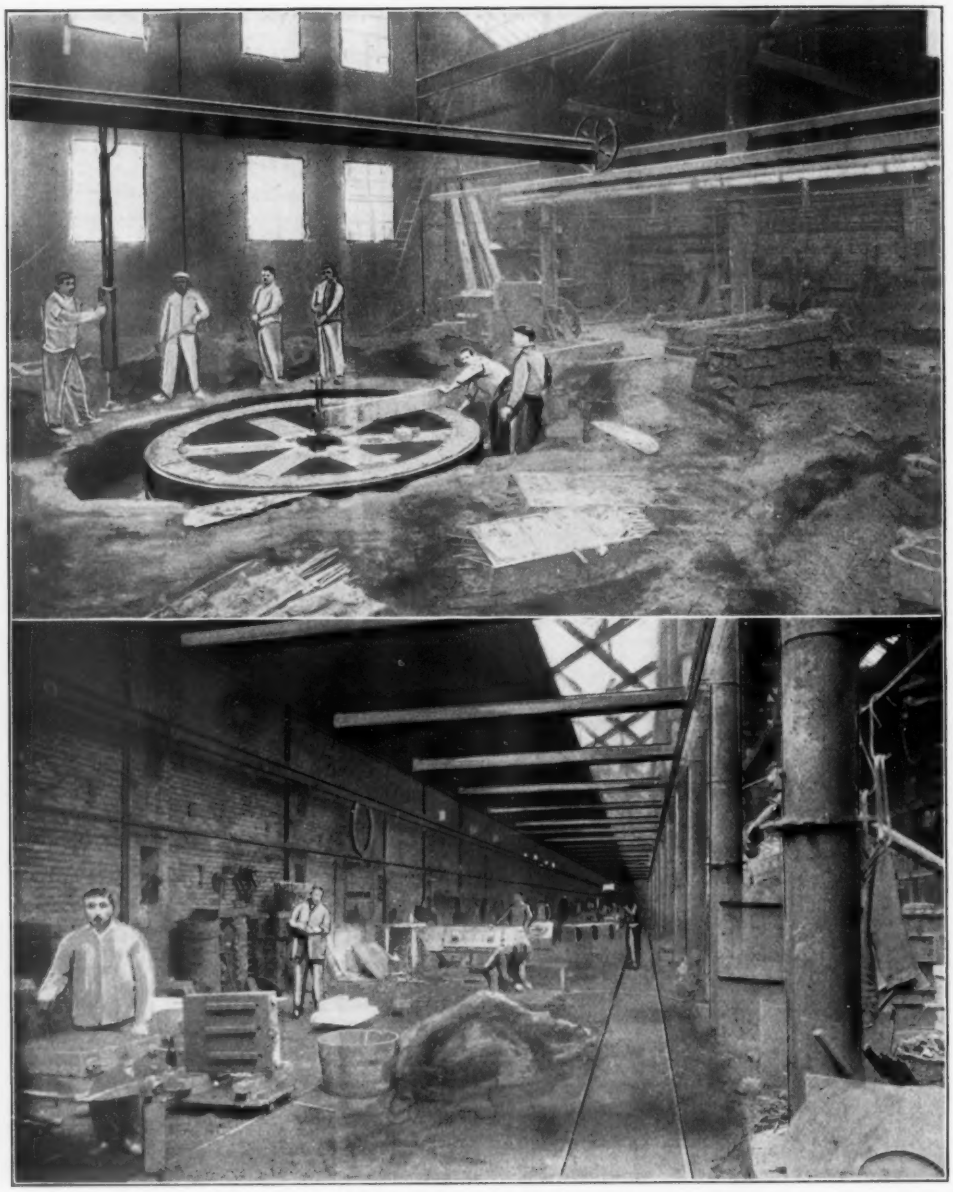
DETAILS OF CUPOLAS.

The tendency in most European foundries is toward a number of small or relatively small cupolas in place of one large one, as in many of our American works. This practice of having several cupolas enables the foundryman to run different mixtures in different cupolas, thus insuring a uniform composition. The receiver also aids in this matter, as it gives the iron ample opportunity to become thoroughly blended. In this country the tendency is toward the use of a larger cupola and the charging of the different mixtures one after the other, taking care to use the iron which comes down between the different mixtures for castings in which variations of the composition would make little difference.

Molding Equipment.

As the product of the foundry is practically uniform, they have been able to divide their work and utilize different portions of the foundry for producing different classes of castings. Upon the floor designed A the frames are molded. At B the fly wheels and at C the cylinders. The fly wheel molds are made up with cores, sweeps and part patterns as shown in one of the halftone illustrations. They also have special equipment on floors A and C to handle the class of work made in these departments.

The small work is molded in the bay opposite the cupolas as shown in one of the illustrations. Special molding machines are used for a considerable portion of their work. The side bay is served both by an industrial



1. FLY WHEEL MOLDING DEPARTMENT. 2. SIDE BAY OF FOUNDRY.

railway and by overhead pneumatic hoists. They also use a pneumatic spraying machine. The main or central bay of the foundry is served by traveling cranes.

Cleaning Department.

The industrial railway or cranes bring the castings to the central bay of the foundry, where they are cleaned preparatory to shipping them to the machine department. The cleaning department is equipped with sand blast outfit, pneumatic hammers, and the necessary cranes and handling devices required for the work.

In the illustration of the cleaning department it will be noticed that the industrial railway crosses this department at right angles to the crane runway of the main shop, thus enabling them to use the main crane for placing castings onto the industrial railway cars.

Core and Sand Mixing Departments.

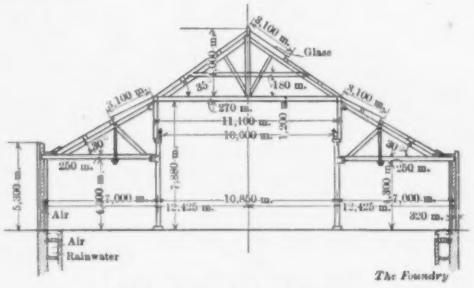
The cores are made in the department ad-

jacent to the core ovens of which there are three shown on the plan. The department is provided with the necessary tools and appliances for mixing sand, both for cores and for molding sand. The foundry is equipped with one grinder made by Krupp and one made by Thivet Honchin, of St. Dennis. In this connection it is interesting to note that in Europe they give a great deal more attention to grinding and mixing machinery for preparing sand and putting it in condition than we do in this country.

The core department also contains two core machines manufactured by Franz Kustner.

General Remarks.

The foundry is heated and ventilated by the Sturtevant system, the apparatus being used for heating and ventilating in winter and for ventilating in summer. In ramming up their heavy molds, they use pneumatic rammers made by the Philadelphia Pneumatic Tool Co.



CROSS SECTION OF FOUNDRY.

This firm constructs an average of 130 engines a year, of 11 different types, and hence the foundry is always busy.

In connection with the foundry they have a chemical laboratory for analyzing the materials received and controlling the mixtures. They also have a testing machine of 20,000 kilos, and a flexure testing machine made by Krupp, also a hardness testing machine made by Keep, of Detroit, Mich.

One interesting point about the plant is the building construction, which is shown very well in several of the illustrations and especially in the cross section of the building. It will be noticed that the crane runway in the center span is supported on cast iron columns and that these in turn support other columns carrying roof trusses. In this country, due to our ready command of cheap structural shapes and to the fact that most of our engineers are skeptical as to the use of cast iron for structural purposes, we have used very few cast iron members for foundry structures.

It will also be noticed that the foundry is lighted mainly by three skylights, one near the ridge of the central portion of the roof, and one upon each side adjacent to the columns supported by crane runways. Side windows are also used in some portions of the plant. Mr. Bollinckx makes one statement that is certainly of interest to Americans and that is that much of the improvement in machines, tools, etc., in use in this plant is due largely to the suggestions obtained by reading *The Foundry*, the *American Machinist*, and the Shop and Foundry Practice Course of the International Correspondence Schools of Scranton, Pa.

NOTES ON SOUTHERN IRON.*

BY ELIOT A. KEBLER.

At first sight it seems rather presumptuous to discuss Southern iron before foundrymen of this district, for it is well known that about one-fourth of all the pig iron in the United States is made in this county, and that the Alabama iron can only reach Pittsburg by paying a freight rate of $4.35, while from the Virginia field a freight of $2.55 must be paid. When we look into this more particularly, however, we find that only one furnace is now making foundry iron for sale in this county, and that during 1902 the South produced 1,952,877 tons of foundry iron out of the 3,851,276 tons produced in the entire United States. In other words the South furnished 49 percent, or practically half of the total foundry iron produced in the United States.

Owing to the great variety of ores which extend through Virginia, Kentucky, Tennessee, North Carolina, Alabama and Texas, the South produces a wide range of iron. In North Carolina the lowest phosphorus and sulphur iron, we believe, in the world is being made, running on an average .025 in phosphorus and sulphur.

In Alabama a low silicon iron averaging about .40 is produced, from which the highest grade of basic rails are now being turned out in the steel works of the Tennessee Coal, Iron & Railroad Co. These stand a greater punishment without fracture than the Bessemer rails generally used; in fact, a blow which will break a Bessemer rail will only bend a Southern basic one.

*Paper read before the Pittsburg Foundrymen's Association Nov. 7, 1904.

At the other extreme, there is produced in Virginia a 50 percent silicon iron, and further South an 80 percent manganese and a 20 percent phosphorus, so that you can readily see the wide range of irons which come from the Southern ores, running from low silicon up to 50 percent, in manganese .25 to .80 and in phosphorus .025 to 20 percent.

This wide range of ores was not at all appreciated when Southern pig iron was first marketed in the North, and all was sold under the one name of Southern iron. You can readily appreciate the trouble which the foundrymen had in trying to use irons widely different in chemical constitution but sold to them simply under the one name. This trouble, however, has been obviated, and the South today has a very close system of grading by fracture. By fracture Southern iron is sold under the following grades, and while silicon is not guaranteed it usually runs about as follows:

No. 1 silvery, 4 to 5 percent.
No. 2 silvery, 3 to 4 percent.
No. 1 soft, 3 percent.
No. 1 foundry, 2.75 percent.
No. 2 soft, 2.50 to 2.75 percent.
No. 2 foundry, 2.35 percent.
No. 3 foundry, 1.90 percent.
No. 4 foundry, 1.75 percent, although it often runs much higher.
Gray forge, 1.35 percent.
Mottled, 1 percent.
White, .30 percent.

The silvery, soft and No. 4 foundry are distinctively Southern grades and are distinguished by the dense silvery appearance of the fracture, which to those not familiar with the Southern irons is so deceptive that foundrymen have added high silicon to them, thinking that the fracture denoted low instead of high silicon. As stated, the above silicons are merely approximate and no guarantee of the analysis is made when iron is sold by fracture. Some of the leading furnaces in the South, however, are also willing to sell strictly by analysis, guaranteeing as follows:

Silicon over 3 percent, sulphur not over .05.
Silicon 2.50 to 3 percent, sulphur not over .05.
Silicon 2 to 2.50 percent, sulphur not over .05 or .075.
Silicon 1.50 percent and under, sulphur not over .075.

These, of course, are the maximum sulphur contents, and the sulphur which is shipped ordinarily runs less than half of the sulphur guarantee.

In regard to using Southern iron, the standard Alabama grades ordinarily contain from .75 to .95 phosphorus, and as it is currently conceded that this percent of phosphorus does not materially weaken the pig these irons can be used for general work without any admixture of lower phosphorus iron. Where especially strong castings are required, results can be obtained by reducing the silicon, or using a lower phosphorus pig in your mix, which can also be secured from the South. In fact, at the foundry with which we were connected for many years, in addition to some 60,000 tons of pipe there were also cast some 20,000 tons yearly of high grade machinery and special castings without the admixture of any Northern iron. Of course, where you have iron made from Lake Superior ores to draw from, it is simpler to make your mixture partly with these; in fact, from our experience we believe best results are obtained in ordinary work by mixing irons made from different ores.

For instance, during the rush of a few years ago, when none of the furnaces were as careful as they should be in their grading, the Northern iron was deficient in silicon and higher silicon than usual were shipped from the South. At that time we visited one foundry which was using all Northern pig and found the arms of their flywheels cracking after they were cast, by reason of the low silicon in the mix; and a few squares away another foundryman using nothing but Southern iron was troubled by the brittleness of his castings, as his mixture was running over 4 percent in silicon. The trouble at these foundries was completely rectified by the one hauling some of its low silicon to the other and bringing back in exchange some of the high silicon. If each of the foundries had been using a mixture of Northern and Southern irons they would not have known that the analysis of each was so completely different from what they had ordinarily received.

Of course, in localities such as this where so much iron is produced from lake ores the demand is principally for the soft grade of Southern iron to take the shrinkage out of the mixture, and thus really strengthen the castings into which the iron is poured; but in addition, foundries are getting splendid results by the use of the lower grades of Southern iron in place of scrap, and to reduce the excess of graphite in heavy casting work. In addition to this the higher phosphorus Southern irons are particularly applicable for the

castings of very light sections, such as stove plates, etc., as the higher phosphorus and silicon make the iron fluid and the castings very sharp and clean. Splendid results are also obtained with the 1 to 1.75 manganese Southern irons which reduces the sulphur and cleans the iron.

There is a growing demand for Southern iron, as the foundries are learning the advantages to be obtained from the use of higher phosphorus in their mixture; and they must now almost rely on the South for this, as the local Northern ore beds, which formerly supplied the phosphorus for the Scotch irons, are being pretty well worked out. And owing to the use of lower phosphorus irons in puddling, and the large amount of steel which is being rolled, the tap mill cinder and roll scale is not as high in phosphorus as formerly, and therefore cannot be used as successfully to bring up the phosphorus contents of the pig iron in the Northern blast furnaces.

In steel, as you are aware, every effort has been made for years to reduce the phosphorus contents, but in this the practice is also changing, and pig iron one-fifth of which is phosphorus is now added to the steel to purify it from dross, and to keep the sheets into which the steel is rolled from sticking together when passed through the rolls. In addition to this it is found that the plates are more easily cleaned and pickled for galvanizing, and in fact the steel is stronger with a limited amount of phosphorus added.

The change in feeling in regard to phosphorus is very striking. For instance, when we started in the iron business as chemist every article we read told of the trouble experienced with phosphorus, and we were greatly surprised after getting up a process for eliminating in the cupola about one-quarter of our phosphorus, to find that the iron was not as suitable for the work as it was before.

THE USE OF OLD CORE SAND.

BY CHAS. A. SMITH.

As there have been several inquiries concerning the manner in which I use old core sand in new core mixtures, I may give the following explanations. After the sand has been used it is still sand except that it is dry, while new sand is raw or moist. The firm for which I worked purchased a pan grinder to grind up old bricks that had been used in the furnace, and it was suggested that we might use this for grinding the old cores. I tried it by first introducing a wheelbarrowful of old cores, or say about 350 pounds. After I had shoveled this amount in I poured in one pailful of water to moisten the sand and ground it for about 15 or 20 minutes. The sand will then be as fresh as new, providing it has not been burned. I used three tons of old core sand over every day and had no trouble in the least with the cores. Care should be taken, however, to see that the sand is not ground too fine, as this would make the cores too close. Oil should be used where old sand is employed and the cores well baked. The amount of oil to be used will have to be determined by experiment, on account of the fact that it depends largely on the style and size of the cores being made. When there are wires in the cores the grinding will free them and they can be picked out of the pan as it comes around.

The question has been asked as to how old core sand should be mixed with new. When first experimenting, I mixed a little new sand with the old and found that it was unnecessary to add any new sand providing the cores are not seriously burned, and I used three tons of old sand over every day without putting any new sand whatever with it. I also use seven tons of new sand each day for making other cores, or in other words, 10 tons altogether. The cores must of necessity be supported by prints and the sand in these prints is not seriously burned and it is from these portions of the core that I get most of the material to be used over. Ordinarily the entire core, prints and all, is hauled to the dump, but this firm would not stand any such wastefulness at present, even though it was their practice formerly. If the core sand is burned considerably I would advise adding one-third new sand, while if it is badly burned, I should advise one-half new sand. Almost every foundryman has some cores upon which he can experiment and I would advise beginning by trying the old core sand on such jobs. If any foundryman has any special difficulties I should be very glad indeed to help him out and answer any questions, or if he wishes information as to how to use it for particular classes of work, if he will let me know what class of work he has to do I will be glad to give him the benefit of my experience.

Every superintendent ought to get acquainted with his core room foreman and give him credit for what improvements and additions he can make in the department, for the

core room is certainly an important department and much saving can be made here by close attention to details. If the core room foreman, however, is opposed to the use of old sand, it may be difficult to get him to make good cores with it. I enclose a duplicate of one of my daily reports, which will show that I used more old sand than any other kind.

Material used in core room, Oct. 22, 1904.

Magnesia	3,868 lb.
No. 4 Waterford	472 "
Lake	2,555 "
Old Core Sand	7,234 "
Sweepings	676 "
Ottawa	234 "
Mill Dust	326 "
Linseed Oil	7 pails (3 gallons to pail)
Holland Oil	6 " " "
Coke	3,393 lb.
Wire	49 lb. and 148 "

A PECULIAR ACCIDENT.

The employes of the foundry of the Marseilles Mfg. Co.'s plant, of Ottawa, Ill., had a peculiar sensation recently. While pouring off a heat, in some unaccountable manner the cupola became charged with electricity and several of the men got severe shocks. The first shock came when one of the men placed a ladle beneath the cupola spout to receive the molten iron. The moment the stream struck the ladle a circuit was formed and the men grasping the handles received a severe shock from the current. It is presumed that an electric light wire became grounded on the cupola.

PIG IRON WARRANTS.

We have received an announcement from the New York Produce Exchange, stating that they have made arrangements for trading in pig iron warrants and giving the rules adopted to govern such business. This has placed the warrants of the American Pig Iron Storage Warrant Co. in such a form that they can be obtained through the Exchange or its agents. Provision has been made for the sale of regular warrants or for the sale of iron for future delivery. Foundrymen will watch this movement with interest to see whether or not it accomplishes the great things claimed for it by its promoters and relieves the strain on the pig iron market by providing a means by which long time contracts can be taken with security, or whether in time it simply drifts into another form of speculation.

PATTERN LOAN RECORDS.

BY R. W. MAC DOWELL.

Many manufacturers, particularly makers of machinery of different kinds, do not operate a foundry of their own, preferring to have their castings made by outside concerns, as by so doing they avoid the additional care and expense connected with the running of a foundry, and are able to devote their entire time and attention to assembling and finishing the machinery proper, besides knowing the cost of castings in advance.

A large number of such concerns have complete sets of all the patterns required for their castings, on hand and ready to send in with the order to the foundry which is doing their work. In this way they know that the patterns will be correct, and they likewise avoid the vexatious delays which would be occasioned if the foundry was obliged to get out the patterns after receiving the order. Where there are a number of orders of this kind, with patterns out for each, it is quite a proposition to keep track of these patterns, or to know exactly how many patterns are out with orders, and what the entire stock of patterns owned by the firm amounts to. Some firms take care of this matter by making a notation on their copy of the order of all patterns sent out with the order, but this method provides very little information, as such a record is scattered and incomplete, and it is impossible to refer to any pattern which has been sent out without the aid of an exceptionally good memory—a valuable asset denied the most of us. On the other hand, it will not do to have any very complicated system of looking after these patterns, as such a system is sure to be neglected or improperly operated, and this will make matters worse than if there was no record whatever. A simple system of pattern records is here described which will take care of this question without very much trouble or clerical labor.

To properly operate a system of this kind, it is, of course, necessary to have a place provided for each pattern or set of patterns bearing the same number or symbol as the patterns themselves, where these patterns must be kept at all times when they are not in use. This will naturally be done by any well regulated concern, whether any such record as this is kept or not. When a pattern is received into stock, whether by being made at the plant, or by purchase from some pattern manufacturer, a place bearing its number is set apart for it, and a card like Form 1 is made out.

The face of this card gives a full description of the pattern and a guide to its location. The reverse gives spaces for record of the firms to whom the pattern may be sent in the future, with orders for castings. These cards are filed in a 4 x 6 cabinet, two drawers being used, one for patterns in stock and one for those out with orders. Any convenient way of filing may be adopted, the cards being provided with projecting tabs to facilitate rapid reference, but the alphabetical arrangement will probably be found most satisfactory, for patterns in stock at least, and is here illustrated. In case of there being more than one pattern of the same kind, cards may be made out for each additional pattern, and filed behind the tabbed card.

When an order is sent out which requires one or more patterns to be sent with it, a shipping tag, Form 2, is made out and attached to it. This is made out in duplicate, the upper part or original being of strong paper. This tag goes to the foreman fully made out (except the part at the extreme right, which is for the use of the consignee) and serves the purpose of an order to ship the patterns to the parties whose name appears in the tag. The foreman then detaches the paper slip from the tag proper, fastening the tag on the pattern, and filing the slip on a nail in the space from which the pattern was removed. If there is more than one pattern, the same thing is done with each. These slips remain on file in the pattern spaces until such time as the pattern or patterns may be returned.

Base Plate #4 Grinder

Name of pattern Emery Wheel Base Plate No. 118 B
Description Material Wood
For Star Emery Wheel #4 Series C
Bought of Woodlaw Pattern Co Order No. 1004 Date 5/26/1902
No. on order 4 Cost each 4.50 Total cost 18.00

Location		Changes, etc.	
		1903	
Room		2 13	Lugs added Gr-2047 C
		1904	
Division	C	3 25	Scrapped
Shelf	11		
Space	118		
Rack			

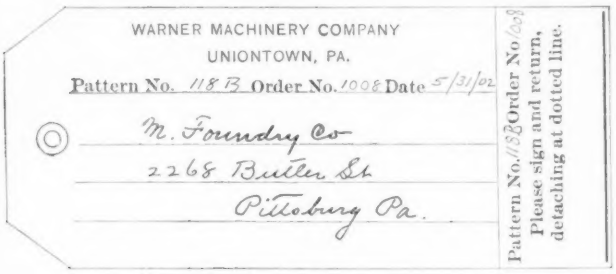
Name of pattern Emery Wh. Base Pl No. 118 B

Date	Sent to	Order	Returned
1903 May 21	M. Foundry Co. Pgh (4)	1008	
		1019	
		1118	
		1128	9/14/03
1903 Oct 19	L. C. & Co. Pgh (2)	1189	
		1192	3/25/04

FORM 1.

As soon as the tag is made out in the office, the card record of the pattern in question is gotten out and a notation made in the reverse side, giving the date, who the pattern was sent to, the order number and the date returned. Any other orders sent to the same concern, on which this same pattern is needed, may have their numbers noted below the first one if so desired, and this is a very good plan when most of the orders go to one concern or are divided up among a very few, so that one firm may have the same patterns in its possession for a considerable length of time. In cases where many concerns are doing work of this kind for the firm owning the patterns, or where patterns are constantly changing about from place to place, it is better to merely note the first number, as there will not be sufficient space on the card if all the numbers are noted. After this is done, the card is filed in the second drawer, where is remains until the pattern is returned. A good plan for filing these cards in this drawer is to have chronological guides provided, filing the card ahead to such date as thought necessary to give ample time for the completion of the

order after the order has been acknowledged; the card may be filed to the date shipment was promised, or a few days later. If after shipment of the castings has been made and received, the pattern is not returned within a reasonable length of time, the card will serve as a reminder of the fact, and a letter can then be written concerning the matter. This is, of course, in the case of some concern which does not regularly supply the firm with castings, as it would not be necessary to have


WARNER MACHINERY COMPANY
UNIONTOWN, PA.
Pattern No. 118 B Order No. 1008 Date 5/31/02
M. Foundry Co
2268 Butler St
Pittsburg Pa.
Pattern No. 118 B Order No. 1008
Please sign and return, detaching at dotted line.

FORM 2.

patterns returned with the order by a foundry which supplies castings from time to time, receiving frequent orders from the firm. Even in a case of this kind, however, it is an excellent thing to have complete records of all the patterns belonging to the firm that are in some one else's possession, and if it is ever necessary to have any changes made in these patterns, or to have them returned at short notice, it can be ascertained without a great deal of trouble exactly where they are.

When the pattern or patterns reach their destination, the foreman, or whoever receives them, signs the name of the firm at the end of the tag, tears it off at the dotted line and returns it. A good plan is to have the name and address of the firm to whom the patterns belong printed on the back of this section of the tag, with just sufficient room left for a one-cent stamp. This will probably get the acknowledgment home sooner. By requiring the return of this acknowledgment, the firm has a receipt for each and every pattern they send out, and in case of any trouble, have something definite to go on. If the slip is not received within a few days after the patterns have been shipped, a letter can be written inquiring the reason, and this will almost invariably bring the acknowledgment. When the acknowledgment is returned, the date can, if desired, be noted on the card record of the pattern.

In this way there is always a complete list on hand of all patterns, whether in stock or in the hands of some other firm. In taking stock of patterns the tag slips on file in the pattern room are counted the same as if they were the original patterns, and the inventory thus taken will agree with the card records, if the latter have been run correctly, and there is no reason whatever why they should not be so run. When stock is taken, a convenient form for an inventory blank is shown in Form 3. This shows the number of patterns on hand and out with orders, with the value of each, and is adapted to checking with the card record.

When a pattern is returned from the foundry that used it, the foreman replaces it in its proper place in the pattern room and returns the tag slip to the office, after noting the date upon it. If there are any remarks he wishes to report, he can do so upon the back of the slip, thus avoiding the necessity of a separate report. Frequently patterns come back in such shape as to greatly depreciate their value, and this can be noted and the attention of the office called to it at once. When the slip is received by the office, a notation is made on the card, and it is replaced in the "Patterns on Hand" drawer, where it remains until the pattern is sent out

RECORD OF PATTERNS _____ 190

No. on hand	No. out	Name of pattern	Number	Value on hand	Value out	Total

FORM 3.

again, or is thrown out. The card now gives a complete record of the pattern from the time it was first purchased to the time it was destroyed. A book record cannot take care of this matter properly, as it would require too much space in any bound book to record the remarks, changes in the shipments of the pattern and of the pattern itself, besides making it necessary to write a great many things which with the cards are taken care of automatically by simply moving the cards to their proper places. In addition to

these things, there are always two separate and distinct lists of the patterns on hand and out with orders, and in a book record these two items are invariably hopelessly mixed. And when a pattern is worn out or broken, the card record of it may be taken from the drawer and either destroyed or filed in another place, so that there are never anything but live matters on record.

A system of this kind costs but little, either for the first expense or for the labor of running it, and will be found of great practical value in a great many respects.

THE MEN WHO ARE RUNNING A FOUNDRY.

In these modern days there are few of those jays
Who think they are running a foundry
But who in the end will find that it pays
If the chemist keeps them out of a quand'ry.
For the chemist can mix by analysis straight
Any pig-iron, scrap or sundry;
And keep things going in spite of the fact
That such men are running the foundry.

Old "hit or miss" methods have gone up in smoke
Since the chemist got onto this level;
Where they guessed at the mix by the way the pigs broke,
And got castings that no one could bevel.
Thus—"Some strong No. 2—700 will do
Some Star to bring it up level;
Put on some plain X—a little scrap next
And trust in luck—and the Devil."

We heard a great deal about "shrink" and "chill"
Ere the chemist was out of his cradle,
Of heats that were nil while the firm paid the bill,
Or the iron froze in the bull ladle.
For the foreman—N. G.—didn't know it was P.
Or anything else—for that matter;
But shoveled coke fast and ran up the blast—
Then wondered why business grew flatter.

Combustion, 'tis true, will develop CO,
Provided there's not O enough;
Chemists know why, and it's sure we all know
This "Vinculum" is merely a bluff.
Whether foreman or molder, a firm would soon know
That his brains are within a small boundary—
For "a great deal depends on the length of the 'blow'
And the man who is running the foundry."

The crystal condition of all foremen I know
Shows this change to be best for the foundry;
For foreman and molder agree that it's so,
And there're no more lost heats in the foundry.
All hustle and rush to get molds enough
For the iron that runs hot and clear—
Thank Heaven, we say, that we've lived to the day
When these Vinculums are no longer here.

The molder today works on the same plan,
Except that he's in a quand'ry;
He can't understand how this "Vinculum" man
Got such a bum poem in *"The Foundry."*
He thinks it remains to write poetry with brains,
Or at least get out of the foundry,
If men with such vim are to melt, pour or skim—
There's not room for us both in a foundry.

L'ENVOY.

'Tis not as our friend would make us believe
That the chemist runs the whole show;
He but figures the mix, gets the blast furnace kicks,
And sees that the castings will go.
We all play our part in this strenuous life,
Till we get to the next world's bound'ry;
And foremen who see why it's Si or P
Are the men who are running the foundry.

BOOMERANG.

FROM ANOTHER VIEW POINT.

The cupola "hung," the "heats" all went bung,
When the "old man" was running the foundry.
"These chemists," said he, "won't do for me,
Their place is in a 'Chink' laundry."

But as you suppose, the castings all "froze,"
Howls came from the "powers that be,"
So the super. he planned, till the "old man" was "canned,"
And he sent for McWilliams, C. E.

McWilliams came round, and the trouble he found
By analysis simply and quickly.
Reduce your C. C. and add some more P.
And your castings won't look so sickly.

With his figures and signs, he stopped the faint lines,
Kept S. in its proper boundary;
Now the super. don't roar, they've good castings once more,
For a chemist is running the foundry.

W. S. ZIMMERMAN.

THE FOUNDRY.

PUBLISHED MONTHLY BY

THE PENTON PUBLISHING CO.

ROSE BLDG., CLEVELAND, OHIO.

CHICAGO: 1164 Monadnock Blk.,
PITTSBURG: 429 Park Bldg.,
NEW YORK: 150 Nassau St.

The subscription price of THE FOUNDRY is $1.00 a year to points in the United States, Canada and Mexico. To Great Britain: Eight shillings. Single copies 15 cents.

Practical articles pertaining to the trade in all its branches are solicited and will be paid for.

Entered as second-class matter at the Post-Office at Cleveland, Ohio.

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TRADE OUTLOOK.

For a number of months preceding November we were only able to sing the same old song of uncertainty and waiting condition in the market, with an occasional slight advance, but a considerable proportion of the foundry capacity idle. We are glad to report now that things have taken a definite turn for the good. There has been quite a decided advance in the price of pig iron, so that at present we can report that some large lots of Southern iron have been sold at $13 per ton for No. 2 foundry, and that $13.50 is now quoted by important interests. One sale of 12,000 tons of Bessemer pig was made at $14 per ton at a Mahoning Valley furnace, the sale being for delivery this year. The current quotation on Bessemer is $14.50, and Northern foundry irons have sold for $14.50, and $15 for No. 2 foundry at the furnace, while $16 is the basis at Chicago.

There has been very extensive buying during the past few weeks, but it must be remembered that this total does not mean iron for immediate consumption. In most cases it represents the desire of the foundrymen to secure a stock of iron for their future work at the lower prices which have been prevailing.

Finished products are rapidly following the advance in foundry iron. This is especially true in connection with steel products. The foundryman will certainly have to increase the price asked for his castings, as he will have to pay not only a higher price for his pig iron but also for his coke, as the price of the latter has advanced considerably and the supply is not large, owing especially to the fact that the Connellsville output is restricted for want of water supply. A good rain in the Connellsville region would improve this condition.

Though a large proportion of the pig iron buying has been to cover future requirements it is nevertheless evident that the output of the foundries throughout the country has been much greater during the past month than for some time before. One encouraging feature is that in the letters we are receiving we frequently find statements that business conditions are improving; in fact, all foundrymen seem to be in a much better frame of mind than they were a few months ago.

COST KEEPING AND GOOD TIMES.

There are many peculiar conditions surrounding any manufacturing plant which must be studied and carefully analyzed if the plant is to run at a profit. It seems like a contra-

diction to state that sometimes it pays to take orders at a loss rather than to shut down the foundry, but let us suppose a case in which there is a foundry with a capacity of 100 tons of castings per day and a fixed charge for interest, official salaries, watchmen, insurance, taxes, etc., of $200 a day. It is evident that this is a flat loss of $2 per ton upon the capacity of the foundry when not running. If the foundry is producing only half of its rated capacity, or 50 tons per day, it would be necessary to charge $4 per ton of the fixed charges against the castings. If pig iron cost $14 per ton and it cost $10 per ton for molding, melting and other running expenses, including loss in melting, the cost of a ton of castings would be made up of the following: Pig iron, $14; running expenses, $10; fixed charges, $4, or a total of $28 per ton.

If, as above stated, the foundry ran on half capacity in hard times, and was getting just $28 per ton for the castings, it is evident that it would be barely paying expenses. If it could only get $27 per ton for the castings, it would be losing $50 a day; but it is evident that it would certainly be economy to keep the plant running under these conditions rather than to lose the $200 per day for the ordinary fixed charges. In like manner it will be noticed that the above charge of $28 was arrived at by figuring in all of the fixed charges with only half of the tonnage; so that if the foundry could run to its full capacity and get $27 per ton for castings it would actually be making a profit, since a fixed charge of $2 per ton in place of $4 reduces the cost to $26 and leaves $100 a day profit.

These figures may not apply to any specific case, but they are stated for a purpose. Many foundrymen now have on their books contracts for castings which under the new conditions will certainly not yield a profit, and in many cases, where a higher price cannot be obtained it would certainly be economy to let such work go to the other fellow. But how many know which job to hold on to and which to let go? It is only by having a carefully devised cost system that will take into account all of the factors in the case that it will be possible to compare the various lines of castings intelligently. There is a serious temptation to say: "Oh, we'll just increase the price of castings half a cent a pound throughout and that will cover the increased cost." This may be true on certain classes of work, but on others it may be far from true. At a time like this, when we stand on the threshold of a period of renewed activity, all thoughtful managers should consider the costs of the work in hand and see that they have a system under which they will make no mistakes as they go forward.

Castings to be Brazed.

BY HARRY MALONE.

It is sometimes necessary to make brass or bronze castings which are to be brazed, and the question is, what composition to use. The following "don'ts" may be of some advantage to any one who has this class of work to deal with. The brazing solder commonly used is made from half spelter and half copper, hence do not use any metal high in spelter for castings that are to be brazed. In other words, have the copper in the castings above that in the solder, so as to raise the melting point of the castings above that of the solder. Do not put any lead into castings that are to be brazed, no matter how much fuss the machinist makes about the cutting qualities of the metal, for lead will render the metal red short. Do not use any tin when the metal is to be brazed, as it will greatly reduce the melting point.

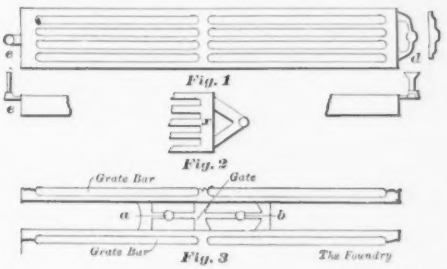
The following alloys have been recommended for this purpose. For a yellow brass use three parts of copper and one part of spelter.

For a red brass, use 88 parts of copper, 10 parts of spelter, and 2 parts of tin. The small proportion of tin in the above alloy will not bring the melting point down low enough to interfere with good working, on account of the fact that the copper is present in such large proportion.

A GRATE BAR DIFFICULTY.

BY H. KAROW.

In the September number of *The Foundry* I noticed an article on a Grate Bar Difficulty.



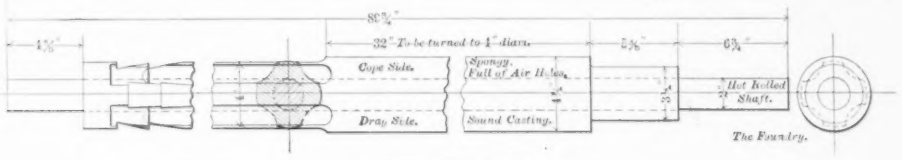
I believe that a large amount of this trouble is due to the method of constructing and gating the pattern. I enclose herewith a sketch showing how I think the pattern should be constructed and how the gate should be con-

nected. I do not know the size of the bars, but presume that they are about 50 in. long. If only one were to be cast in the mold, I would gate the mold, as shown in Fig. 1, while if four were to be cast in one mold I would arrange a gate between them, as shown in Fig. 3, in which B is the pouring gate and A is the riser.

If I arranged them as shown in Fig. 1, I should have a gate at D and arrange a riser at E. I wish to call attention to the fact that the space between the bars should have ample fillets, as shown, and not be made with square corners, as shown at X, Fig. 2.

A CASTING DIFFICULTY.

I send herewith a sketch of a roller which we are having considerable difficulty in casting successfully. You will notice that a 2-in. shaft is placed in the mold and extends the entire



A CASTING DIFFICULTY.

length of the casting. The round part of the casting comes spongy and open, but this always occurs in the cope side. We are casting them horizontally and find that it is very hard to keep the shaft central. However, our greatest difficulty is the spongy or honeycombed structure on the cope side of the casting. If any one can give us light upon this subject, it will be greatly appreciated.

G. L. B.

A GRATE BAR DIFFICULTY.

BY P. M. WOODEN.

I noticed in the September number of *The Foundry* an article entitled A Grate Bar Difficulty. I have had a similar experience and think that the advice given in connection with the article is good, but I found that the best thing to do was to lighten the inside ribs of the pattern, having the center one lightest and each succeeding one slightly heavier. If it is desired that the top of the bar shall present the same face upon each rib, this can be accomplished by casting the center ribs with a T head, with a web extending down from it. The central rib would have the thinnest web and each succeeding one a slightly wider web. After changing my patterns in this manner I had no trouble with cracking.

A MEMORIAL TO HENRY HANSEN.

At the meeting of the Associated Foundry Foremen at Indianapolis in June a committee was appointed to draft resolutions concerning Henry Hansen, former editor of *The Foundry*, for presentation to his widow and for publication in trade papers.

Mr. Hansen was the founder and first secretary of the association, and the members appreciated the fact that he had put in a great deal of time without any compensation whatever to make the association a success. In fact, its very existence is a monument to his untiring efforts. His genial manner and willingness to help any one made him a great favorite among the foundry foremen all over the country and the organization of able men which he has left behind is certainly the best monument he could leave.

The committee appointed consisted of Jas. A. Murphy, Arch. M. Loudon, F. C. Everitt and President Thomas, as an ex-officio member. The work of the committee was completed recently and the resolutions were engrossed and framed in a neat frame 20 by 26 inches. The frame was black, lined with silver. The resolutions were finished in black, gold and purple, and a copy of them was sent to Mrs Hansen with the following letter:

Mrs. Henry Hansen, Detroit, Mich.:

Dear Madam—In behalf of the Associated Foundry Foremen, which body took action at the Indianapolis convention on the death of Mr. Hansen, their first and valued secretary, by appointing a committee of three to draw up a set of resolutions to be presented to his family, I hereby notify you that said resolutions have been completed and expressed to you, prepaid.

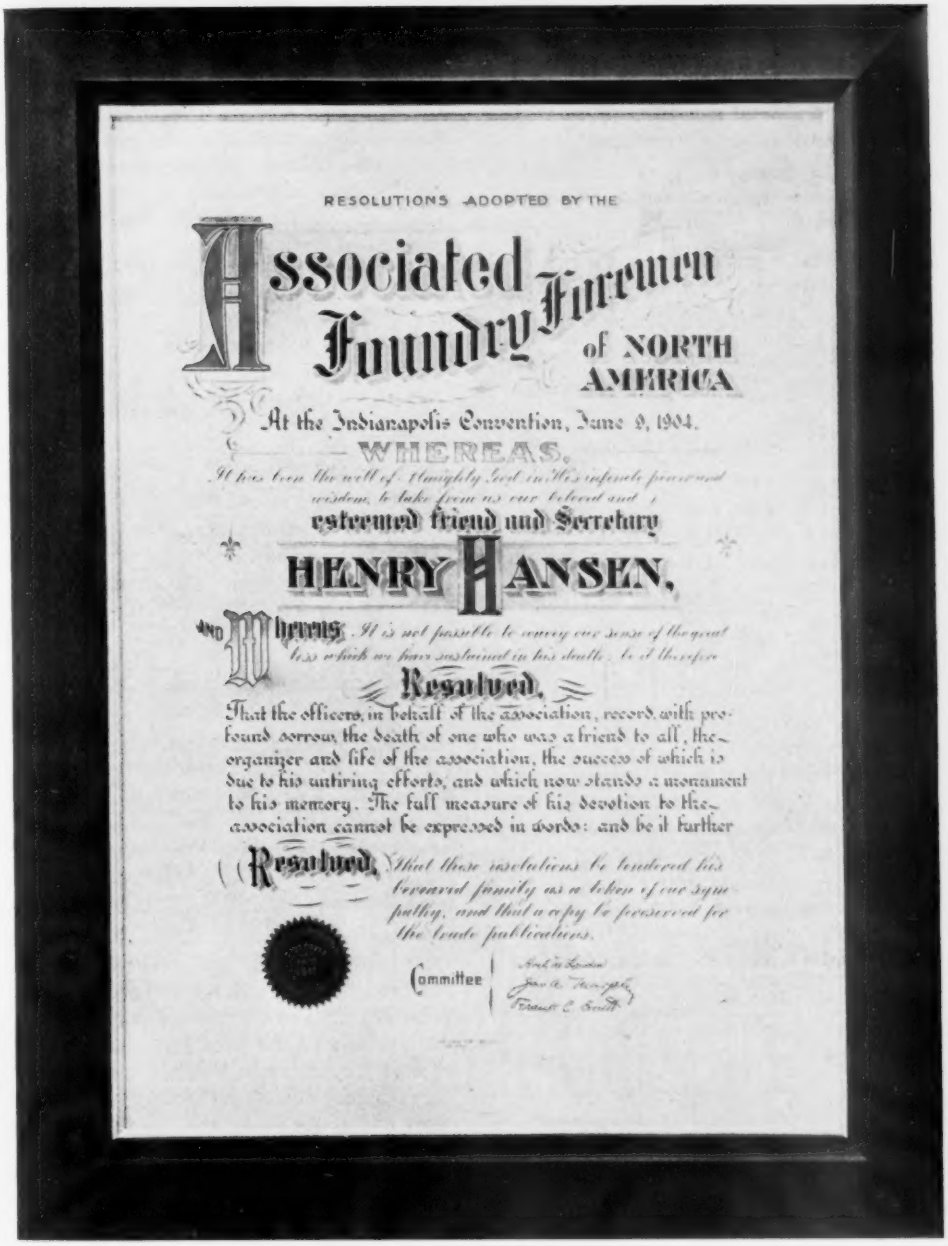
It is not necessary that we should try to express our feelings in this communication, as they are embodied in the resolutions and to such a degree as words alone could express. We sincerely hope, however, that your future will be crowned with success, and your happiness as complete as circumstances will permit.

With kind regards, we are

Respectfully yours,

THE ASSOCIATED FOUNDRY FOREMEN.

F. C. EVERITT, Secretary.



RESOLUTIONS ADOPTED BY THE

Associated Foundry Foremen of NORTH AMERICA

At the Indianapolis Convention, June 9, 1904.

WHEREAS,

It has been the will of Almighty God in His infinite power and wisdom, to take from us our beloved and esteemed friend and Secretary

HENRY HANSEN,

AND Whereas, It is not possible to convey our sense of the great loss which we have sustained in his death: be it therefore

Resolved,

That the officers, in behalf of the association, record with profound sorrow the death of one who was a friend to all, the organizer and life of the association, the success of which is due to his untiring efforts, and which now stands a monument to his memory. The full measure of his devotion to the association cannot be expressed in words: and be it further

Resolved, That these resolutions be tendered his bereaved family as a token of our sympathy, and that a copy be preserved for the trade publications.

Committee

A MEMORIAL TO HENRY HANSEN.

Mrs. Hansen replied with the following letter:

Mr. Everitt, Secretary, New York, N. Y.:

Dear Sir—Your letter and also the beautiful resolutions have been duly received, and I wish to thank the association for the kindness they have shown us in this our trouble, and it is a comfort to know that my husband had so many true friends who have shown themselves friends to his family in sending us this memorial.

I sincerely hope that the association will meet with success in every way. Thanking you all again, I remain Very respectfully,

MRS. HANSEN.

Realizing that many of the foundry foremen are interested in the Hansen Memorial, Mr. Everitt informs us that a good photograph of this memorial, finished in carbon on a 10 x 12 mount, can be furnished for $1.

LOSS IN MALLEABLE FOUNDRY.*

BY R. F. FLINTERMAN, CHICAGO, ILL.

It may be of interest to see in detail the results of a number of test heats lately made at the McCormick Works, International Harvester Company, to determine the amount of loss and shrinkage in malleable work. The melting was done in ordinary air furnaces. In tables Nos. 1 and 2 it is shown in detail how the various heats were made up and also the total amount of iron recovered, both as castings and as scrap (sprue, floor riddlings, mill riddlings, etc.). The difference between total iron recovered and heat as made up gives the loss or shrinkage, this loss running from 3.36 per cent. to 8.03 per cent.

TABLE NO. 1.

Test Heats Taken in Malleable Foundry, May 2, 1904.

	Heat No. 1		Heat No. 2		Total	
	Pounds	Per cent of Melt	Pounds	Per cent of Melt	Pounds	Per cent of Melt
Pig Iron	14,720		9,755		24,475	
Sprue	15,200		10,520		25,720	
Total Iron Melted	29,920		20,275		50,195	
Product						
Iron from Milling Slag	159	00.53	327	01.61	486	
Scabs from Furnace Spouts	145	00.49	210	01.04	355	
Sprue (Includes Floor Riddlings)	12,035	40.22	7,927	39.10	19,962	
Total Scrap	12,339	41.24	8,464	41.75	20,803	
Castings (Good and Bad)	16,304	54.49	11,130	54.89	27,434	
Total Product	28,643	95.73	19,594	96.64	48,237	
Loss	1,277	04.27	681	03.36	1,958	
Slag from Skimming Heat	1,249	04.17	1,545	07.62	2,794	
Iron Recovered from Slag	159	12.	327	21.17	486	

TABLE NO. 2.

Test Heats taken in Malleable Foundry, May 19, 1904.

	Heat No. 3		Heat No. 4		Total	
	Pounds	Per cent of Melt	Pounds	Per cent of Melt	Pounds	Per cent of Melt
Pig Iron						
Car No. 61302	12,000	50.00	4,500	18.74	16,500	34.36
" " 70988	.....	.....	7,500	31.22	7,500	15.62
Total Pig Iron	12,000	50.00	12,000	49.96	24,000	49.98
Sprue	12,000	50.00	12,020	50.04	24,020	50.02
Total Iron Melted	24,000	100.00	24,020	100.00	48,020	100.00
Iron recovered from Milling Slag	234	00.97	266	01.11	500	01.03
Scabs at Furnace Spouts	155	00.65	250	01.04	405	00.85
Mill Riddlings	28	00.12	29	00.12	57	00.12
Sprue (includes Floor Riddlings)	8,983	37.43	8,954	37.27	17,937	37.35
Total Scrap	9,400	39.17	9,499	39.54	18,899	39.35
Castings (Good & Bad)	12,673	52.80	13,532	56.34	26,205	54.57
Total Product	22,073	91.97	23,031	95.88	45,104	93.92
Loss or Shrinkage	1,927	08.03	989	04.12	2,916	06.08
.....	.....	.....	.....	.....	.....	.....
Slag from Skimming above heats	1,618	06.74	1,817	07.56	3,435	07.15

It is further attempted to ascertain as nearly as possible to what cause the loss and shrinkage might be due. Below are given in detail the methods employed for determining the character of the loss due to the chemical changes of various kinds.

Mixture was made up of pig iron and sprue, the composition of which is shown in Table No. 3.

TABLE NO. 3.

	Silicon	Sulphur	Phosphorus	Manganese	Total Carbon
14720 lbs. Pig Iron	1.51	.036	.168	.693	3.72
15200 lbs. Sprue etc	1.10	.054	.130	.388	2.56

TABLE NO. 4.

	Silicon	Sulphur	Phosphorus	Manganese	Total Carbon
Analysis of mixture as it went into furnace	1.30	.045	.149	.53	3.13
Analysis of hard iron tapped from furnace	.85	.077	.160	.33	2.55
Loss	.45			.20	.58–1.23 %
Gain		.032	.029		.061
Total loss					1.169 %

Slag Analysis.

Tr. total amount of Slag ..... 1249 lbs.
Iron recovered by Sly Mill ..... 159 "

Slag residue ..... 1090 lbs

This would make the composition of the mixture as it went into the furnace as given in Table No. 4. For sake of comparison we give also analysis of the hard iron, that is, of the finished product as it is tapped from the melting furnace. This shows plainly what changes occur and at the same time shows what losses are due to such chemical changes:

This slag was carefully sampled and was found to analyze as follows:

Metallic Iron (removed by magnet) 5.20%
" " (determined by titration) part present as Ferric Oxide and part present as Metallic Iron ..... 21.51–32.4 Ferric Oxide
Alumina 14.50
Lime ..... .85
Silica 51.38

Total iron including that removed by magnet and that determined by titration amounts to 26.7 per cent., which represents iron lost and not recoverable. This accounts for 291 lbs. (26.7 per cent of 1090 lbs.) and amounts to .90 per cent. of total mixture.

* Paper read at A. F. A. Convention, June, 1904.

Thus by reason of chemical changes during melting and by determining amount of iron contained in slag and not recoverable, we have accounted for the following: 1.169 plus .90 equals 2.069 per cent.

The total loss as per report already made (Table No. 1) amounted to 4.27 per cent., which leaves 2.2 per cent. still unaccounted for. This loss may be accounted for in the following manner:

Our mixture as given hereinbefore contained pig iron and sprue. The sprue had previously all been rattled and may be counted as clean iron. The pig iron is, of course, more or less oxidized and also sand coated. Accepting 10 per cent. as figure represented by sand present, 1472 lbs. of sand were weighed up and counted as iron.

Now, referring to Table No. 1, it will be noted that among the various products of the melt we have 12035 lbs. of sprue. This sprue as returned includes sand adhering to it. By actual test we have determined that this sand amounts to 7.5 per cent. of the weight of the sprue. We are, therefore, turning in as iron in our product record 902 lbs. of sand (7.5 per cent. of 12035 lbs.) 1472—902 equals 570 lbs. The other products as reported are all cleaned up before weighing. The 902 lbs. of sand adhering to sprue in product partially offsets the sand weighed up with pig, but still leaves 570 lbs. of sand which must have passed into slag. This 570 lbs. amounts to 1.9 per cent. of total mixture, thus making total loss accounted for 1.9 plus 2.07 equals 3.77 per cent. which is within .30 per cent of loss as reported.

If 10 per cent. is considered too high for the amount of sand adhering to pig iron, this last loss as accounted for will, of course, be reduced.

There will be further loss which cannot be determined, as for instance, the oxidized iron on inside of furnace which has passed into bottom; there may be other slight losses due to various causes. However, losses other than those accounted for cannot be very great. It would appear, therefore, that the loss of 4.27 per cent. is about right.

Concerning figures as herein given will say that the analysis of sprue which was put into mixture was obtained by taking 10 pieces of hard iron; borings were taken from each of these pieces, the borings were mixed and then analyzed.

In order to get at the analysis of the finished product, three test bars were taken at beginning, middle and end of tap. The bars were sampled and borings were mixed and analyzed.

We add now figures for next three test heats, all sampling, calculation, etc., having been made in same manner as with No. 1 heat, which we have just explained in detail.

TABLE NO. 5.
Heat No. 2.

	Silicon	Sulphur	Phosphorus	Manganese	Total Carbon
6790 lbs. Pig Iron..	1.51	.036	.168	.693	3.72
2965 lbs. Pig Iron	1.67	.017	.120	.737	3.60
10520 lbs. Sprue etc.	1.13	.066	.152	.349	2.77
Analysis of Mixture	1.33	.048	.152	.520	3.21
Analysis of Metal as tapped	1.03	.073	.160	.330	2.66
Loss	.30			.190	.55—1.04
Gain		.025	.008		— .044
Total loss					—1.007

Slag Analysis.

Total amount of Slag ..... 1545 lbs.
Iron recovered by Sly Mill ..... 327 "

Slag residue ..... 1218 lbs.

Analysis of Slag Residue.

Metallic Iron (removed by magnet) 11.7%
" " (determined by titration) 24.3
Silica 46.2

Total Iron not recoverable equals 36% of slag residue—equals 438 lbs. The Iron not recoverable amounts to 2.1% of total mixture.

Loss due to Sand.

9755 lbs. Pig Iron (10% sand) carries ..... 975.5 lbs. Sand
7862 " Sprue (7½% sand) " ..... 589.5 " "

Difference ..... 386.0 lbs. Sand

This loss amounts to 1.9% of total mixture.

Total Loss in Detail.

Due to chemical change 1.01%
Due to iron which cannot be recovered from slag.. 2.10
Due to sand loss 1.90

5.01%

These figures are 1.65% in excess of loss as reported in Table No. 1.

TABLE NO. 6.
Heat No. 3.

	Silicon	Sulphur	Phosphorus	Manganese	Total Carbon
12000 lbs. Pig Iron	2.00	.025	.12	.78	3.81
12000 lbs. Sprue	1.08	.057	.16	.17	2.37
Analysis of Mixture	1.54	.046	.14	.47	3.09
Analysis of Metals as tapped	1.25	.057	.16	.31	2.46
Loss	.29			.16	.63—1.08
Gain		.011	.02		— .031
Total loss					—1.049

Slag Analysis.

Total amount of Slag ..... 1618 lbs.
Iron removed by Sly Mill ..... 234 "

Slag residue..... 1384 lbs.

Analysis of Slag Residue.

Metallic Iron (removed by magnet) 14.1%
" " (by titration) 22.7
Silica 47.9
Alumina 15.4

Total Iron not recoverable equals 36.8% of slag residue, equals 509 lbs. The Iron not recoverable amounts to 2.1% of mixture.

Loss due to Sand.

12000 lbs. Pig Iron (10% sand) carries 1200 lbs. Sand.
8983 " Sprue (7.5% ") " 674 " "

Difference..... 526 " "
This loss amounts to 2.2%.

Total Loss in Detail.

Due to chemical change..... 1.05
Due to iron which cannot be recovered from slag, 2.10
Due to sand loss..... 2.20

5.35%

Figures as reported by Table No. 2 are 2.68% in excess of this.

TABLE NO. 7.

Heat No. 4.

	Silicon	Sulphur	Phosphorus	Manganese	Total Carbon
4500 lbs. Pig Iron	2.00	.025	.12	.78	3.81
7560 lbs. Pig Iron	2.46	.013	.14	.79	3.48
12020 lbs. Sprue	.99	.076	.17	.25	2.21
Analysis of Mixture	1.64	.045	.15	.52	2.90
Analysis of Metal as tapped	1.33	.055	.15	.31	2.67
Loss	.31			.19	.23—.73
Gain		.01			—.01
Total loss					—.72

Slag Analysis.

Total amount of Slag ..... 1817 lbs.
Iron removed by Sly Mill ..... 266 "

Slag residue ..... 1551 lbs.

Analysis of Slag Residue.

Metallic Iron (removed by magnet) 18.5%
" " (determined by titration) 19.7
Silica 43.2

Total Iron not recoverable, 38.2% of slag residue, equals 592 lbs. The Iron not recoverable amounts to 2.4% of mixture.

Loss due to Sand.

12000 lbs. Pig Iron (10% sand) ..... Carries 1200 lbs. Sand
8954 " Sprue (7½% ") ..... " 671 " "

Difference..... 529 " "
This loss amounts to 2.2%.

Total Loss in Detail.

Loss due to chemical change ..... .72%
" " " iron which cannot be recovered by Sly Mill. 2.40
Loss due to sand loss 2.20

5.32%

This figure is 1.2% in excess of loss as shown by Table No. 2.

TABLE NO. 8.
Recapitulation.

	HEATS				Average
	No. 1	No. 2	No. 3	No. 4	
Loss due to chemical change	1.17%	1.01%	1.05%	.72%	.98%
Loss due to iron not recoverable	.90	2.10	2.10	2.40	1.87
Loss due to sand loss	1.90	1.90	2.20	2.20	2.05
Total loss	3.97	5.01	5.35	5.32	4.90
Total loss as shown by Tables No. 1 and 2	4.27	3.36	8.03	4.12	4.94

These figures go to show that 5 per cent. loss should be about maximum loss for our practice. While there is more or less lack of correspondence in results as obtained, the results are nevertheless near enough alike to show that a loss of 8.03 per cent. as shown on No. 3 test cannot be right. This excessive loss must be due to some error in weighing back product of melt, since there is nothing in analysis of figures of this heat to account for loss being so much higher.

SUCCESSFUL BRASSFOUNDING.*

BY JOHN F. BUCHANAN, SYDNEY, N. S. W.

Foreword.

In responding to the request of your secretary for "a short paper on some foundry topic, brass or iron," I experienced (in addition to the natural trepidation of an ordinary molder who fancies he can use the "peen" to better advantage than the pen) great difficulty in choosing a subject worthy the attention of such a successful body as the American Foundrymen's Association.

Inasmuch as brassfounding can only interest a section of your members, and I am doubtful if my experience can hold even that section from weariness, it is just possible that a change from the didactic to the personal form of address may assist both the hearer and the writer to be more at ease in the fulfillment of their respective duties. As the son of a brassfounder, a foreman with a fair record, and an occasional contributor to the English and American trade journals, I claim your indulgence while I introduce a few sidelights on "Successful Brassfounding."

Introductory.

The title of this paper would seem to call for a double-barreled definition, *viz.*: Why Successful? and What Class of Brassfounding? Success, I take it, is that which we

* Paper read at A. F. A. convention, June, 1904.

expect in a properly modeled love story—a happy termination; brassfounding is the antithesis of that, for although it is the oldest branch of the metal casting industries (and it had a happy beginning), it has fallen on degenerate days and is seldom encouraged except when the utilitarian art of the iron or steel founder is either unequal to the occasion or unable to harmonize with the general scheme. I question if the *gray* or *malleable* gentleman who prides himself on turning out castings, which unfortunately have consumptive tendencies, has ever given a serious thought to the "thing-of-beauty-and-joy-forever" variety produced by his fellow founder Mr. Alloys, the son of Alchemist.

Legendary.

Just think! The world's history might easily be written in chapters on bronze, the opening numbers of which may be roughly summarized thus:

Chapter I.—Palæolithic man, worn with the worries of the Stone Age and grumbling at the necessity for renewing the cutting edge of his uncouth implements, expressed in the hearing of his grandson a longing for more enduring tools. The boy, eager to acquit himself, after long and adventurous search, brought forth triumphant from a fissure in the Great Rock a nugget which, for want of a better name, was afterwards called *Aurichalcum* (i. e., Golden Copper). And thus originated the first artificer in metals!

Chapter II.—The artificers grew and multiplied, and the harvests being sooner garnered with the improved appliances, they waxed thoughtful, but no less industrious. Bending their minds to those things most worthy of worship, they adorned the temples, made god-like images and warlike weapons, raised monuments to their heroes and generally behaved themselves in a manner becoming the fortunate scions of the ever memorable and almost everlasting Bronze Age.

Chapter III.—In the Middle Ages, the church being all-powerful and desiring to proclaim the fact for all time, inspired the now skillful bronzefounders to invent some *striking* vessel which would yet speak when her ministers were dead. The bellfounding feats of these patriarchs are beyond us today, and we have evidences in many parts of the world that they were no fool molders anyhow!

Chapter IV.—When the so-called civilization of the Western nations created that lust for Empire, which still threatens to engulf us, those docile workers, now called brassfounders, were requisitioned to produce an engine which would send the superfluous savages occupying the desirable places of the earth, into "Kingdom Come." With characteristic ingenuity befitting such highly developed craftsmen they compounded a metal *able to withstand the shock!* Gun-metal, as you are aware, is used to this day—sometimes successfully. It has a name which is universally admired and for *that* the public pay ungrudgingly the highest price. Some day an enthusiast from the ranks of the "Brassies," with a quicker imagination than I, may be inspired to write up more fully the historical side of Successful Brassfounding. Meanwhile, we must get back to the modern and more practical aspects of the subject.

Practical.

Successful brassfounding is only to be accomplished by (1) specialization of the work, (2) system in the making up of mixtures, and (3) the adoption of all the mechanical and commercial aids which apply to the other branches of foundry practice. Americans do not need to be told to specialize; they are compound specialists already. But I observe that even they have various methods of arriving at the same results, which proves that there is no rigid formula for success in anything. In some quarters successful brassfounding means the art of making a legitimate profit on brass castings; in others it means the art of making castings from copper alloyed with the greatest amount of the cheapest adulterants compatible with certain tests or specifications. Here we have the choice of two straws, either of which may break the (brass) camel's back when carelessly applied.

Retrospect.

Ten years ago I made my debut as a foundry foreman in a large engineering shop in the capital of Scotland, where ornamental brasswork, gas, water, and steam brass fittings, millwright and general engineer's brass castings, locomotive and admiralty castings *were all done on one floor!*

That was, and is, a successful brass foundry; but, looking back on my experience there, I am convinced that the work could have been more satisfactorily accomplished, with more comfort to the employees and greater profit to the employers if, instead of carrying on the business with one shop foreman and a leading hand for each class of work, two of the lines had been dropped, so that the others could be developed enough to warrant the appointment of a special foreman for each. Later in my career as a foreman I graduated to a charge in a gray-iron foundry doing general brass castings. In this case the brass furnaces were at one end of the shop and the cupolas were at the other end. The treatment which the metal in that brass foundry received, nearly drove me crazy. Scrap was made recklessly, the spare metal was poured into "pancakes" instead of into clean ingot molds, the crucibles were dumped about like hand-ladles and left in the most convenient place for receiving slops. In less than two days there was an unheaval in that shop and great was the shock thereof! But it took time and many sermons to put it in the way of being what I would term a successful brass foundry.

Splendid Isolation.

Since then I have always held that it is a mistake to carry on combination brass and iron foundries, unless there is some barrier between the two sets of molders; otherwise the sands get mixed, the scraps get mixed, and in many cases the brass end becomes the happy hunting ground for a few incompetents from the other end. You must not infer from this that I deprecate the running of brass and iron foundries conjointly; I only wish to insist that iron foundry methods will not do for the brass foundry. The two kinds of castings cannot be made by the same process, or under the same foreman, *with the best results.* The metals and the molds require different treatment and the higher price and more sensitive nature of the alloys demand that keener vigilance and greater skill should be employed to handle them. The brass molder must exercise greater care and neatness in his work because there is less divergence from pattern sizes permissible in his castings; he must be alive to the fact that defects in brass castings are always more unsightly, more difficult to remedy and more costly, than similar defects in iron castings; in green sand work he must avoid fins; and with dry sand castings, "wings" thicker than a trowel blade are a reproach to the ensemble and a menace to his position in the ranks of successful brass molders. Obviously foundrymen have nothing to gain by trying to embrace all the branches. Besides, in arranging a foundry, it is a great deal easier to provide facilities for a definite class of work than to meet the demands of a mixed trade.

On the other hand, just as greater economy can be effected in an iron foundry with a machine shop on the premises, so it is with a brass foundry contiguous to an iron foundry. Core-irons, rigs and tackle of every description can then be had at first cost, and, if heavy brass castings are made, many of the tools can be more fully employed between the two foundries than in one alone. One of the greatest drawbacks in an isolated brass foundry doing heavy castings is the expense of getting out tackle.

Extravagance.

I could direct you to several world-famed marine brass foundries in Glasgow where brass "core-irons," brass building rings, brass bows for propellers, brass core boxes, box-parts, etc., are in daily use. I fancy I hear someone exclaim, "This is extravagance with a vengeance!" Granted! Yet the saving made by producing the tackle at cost and the economy of time in getting through with the jobs seems to counterbalance the initial expense. At any rate the foundries I refer to are, in every case, successful.

General Brassfounding.

The dividing line between the various branches is not so well marked in brass as in iron foundries. "General Brassfounders" is still a common designation for foundrymen casting in alloys to adopt. Doubtless many are willing to undertake work of a general kind, but if we probe into the actual output, we will find that brass founders are biased in some particular direction. Some prefer to do light or ornamental castings, while others look more to tonnage. However ready they may appear to be to face anything in the shape of brass castings certain lines are always given the precedence. One reason for this is the increas-

ing number of alloys now in demand. Twenty years ago "General Brassfounders" was the correct description of the more successful firms, whereas now we have to distinguish between several kinds of engineer's, plumber's and other dependent brass founders. Shop mixtures have grown from the mnemonic recipes of the secretive foreman of the old school to the inexhaustible tables and memoranda of the twentieth century scientific expert on the subject; but, commercial considerations apart, it is an open question whether the multiplicity of cheap alloys now used, has helped, as much as it has hindered, the progress and prosperity of the brass castings trade.

More Retrospect.

Many a time, and oft, have I been told about the "good old days" when gun-metal was hall-marked and all the other alloys were as true to standard as the coin of the realm—the days when they did not know the use of drugs in the metal trades, or how to disguise or load base metals in the alloys. Nevertheless I am no pessimist. I believe the more ardently we study alloys the more we shall add to the general store of experience and wisdom in the use of them, and the better we shall be able to adapt our business to the needs of our time.

Prophecy.

I also believe the day is not far distant when the metallurgist will do for the brass founder what the chemist has already done for the iron founder—regulate his mixtures, fix new standards, determine the casting temperatures and the best conditions to secure the highest results out of the various combinations of metals and metalloids. It is in this, the subject of mixtures and the methods of calculating and manipulating them, that we reach the kernel of the question before us. Many good molders and excellent foremen have failed to realize success because of their inability to grasp these most important factors in brass foundry management. They were molders first and mathematicians and metallurgists a very long way after. Lest I should lead someone to think I pose as a scholarly person, I beg to say that I know neither mathematics nor metallurgy as they should be known, but for many years I have been studying the practical difficulties to be met with in brass foundry practice and discussing the problems dear to the heart of the man who takes a genuine interest in his work. No one deplores the limits of secondary education more than I do and I would urge upon any gentleman present who has an earnest man in his employ, to put every incentive in front of that man if he values skill in handicraft.

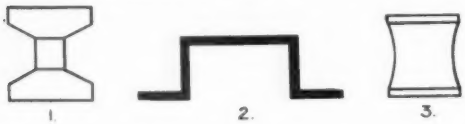
Mixtures.

But, to return to our mixtures; the percentage plan is now used for stating mixtures in brass as well as in iron foundries. The old-fashioned method of stating brass mixtures in pounds and ounces was always troublesome unless when the original quantities were adhered to. A point of economy which is frequently lost sight of is that the amount of metal required for each heat should receive the most careful calculation. Every pound melted over the actual requirements increases the waste and adds to the cost of production. "Spare" metal is a necessity in every foundry, but the motto in the brass foundry should be, "Be sparing with it."

Like chaplets, patternmaking, and other "necessary evils," it wants looking after. In many of the branches of brassfounding the use of old metals is imperative. Contracts are sometimes let for little more than the price of the new alloy, and unless old metals were of service it would be impossible to carry out the work. This is where the man experienced in the selecting and blending of metals shines. By a judicious examination of the available scrap he is able to make a cheaper, though not necessarily a worse, alloy than the other fellow. In building up mixtures, no brass scrap should be reckoned to contain to exceed 40 percent zinc, and no G. M. scrap should be reckoned below 75 percent copper. Lead and tin in G. M. scrap may be approximated by the fracture, skin and color of a cold sample, while iron, phosphorus and aluminum can not be mistaken in the molten condition of the metal. In figuring a mixture for a brass alloy, if old metals are used, it is customary to make an allowance for volatilization of zinc, say, from .5 to 1.0 percent, according to bulk, but with alloys containing over 8 percent tin, the loss of tin on remelting would be nearer .25 percent. The great secret of good mixing is to avoid "soaking," and adopt uniform grades, marking castings

and runners according to grade number and keeping separate bins for each. If much old metal is used in making the lower grades, half worn crucibles should be used, the newer pots being reserved for melting the cleaner metals. All metals should be charged into crucibles in the vertical position to avoid wedging and other dangerous contingencies.

Skimmings and furnace ashes should be ground, washed and melted down by themselves, for mixing with known proportions of other metals. Borings should be classified and used in the first charge of metal to act as a cushion and to assist in the reduction of the solid portions. I have noticed that borings of almost any of the alloys *are more fluid when remelted* than the original mixture. Indeed I have often taken advantage of this peculiarity in running thin castings of large area, also in "burning" thick sections economically.



Chaplets.

Chaplets for finished brass work should be cast from the same composition as the castings. A convenient form of chaplet is the girder shape, shown in section at Fig. 1. These can be cast in long sprays of the various thicknesses and cut off as required. For heavy castings, copper springer, Fig. 2, or stud chaplets, Fig. 3, will be found to give complete satisfaction. Molds should not be poured if the metal is not in perfect condition for casting; it is better to lose the cost of melting than to risk the cost of remolding and machining.

Skin-Drying.

Many small molds for brass are skin-dried previous to being cast. An "industrial railway" from the molding stalls to the drying stove is a great convenience, the molders need not handle the flasks except when making or closing the molds. I have often been struck with the difference in the weight limit of green sand castings in cast iron and in brass. Molds for cast iron are generally made from more porous material than molds for brass; molten iron has a higher temperature than brass, and yet it is possible to make a heavier and cleaner casting in green sand with the former. To get over this difficulty, several large brass foundries on the Clyde skin-dry heavy green sand molds by saturating them with naphtha and setting them alight. When the naphtha has completely burned off, these molds, which may represent castings weighing up to half a ton, are closed and immediately cast. I mention this as a unique example of heavy green sand work suitable for castings of large area and medium depth.

The brass founders cannot afford to despise the mechanical aids to molding; success for them, even more than for others, depends on a proper equipment; their castings must be more accurate, as to weight and dimensions; for the smaller machining allowance given them leaves less margin for inaccuracies. That is why the habit of "bedding in" or the use of "stakes" is not generally practiced in brass foundries. Properly fitted flasks, an orderly casting floor, and a well-furnished cleaning room are business-like signs in an up-to-date brass foundry. Further, your true brass founder likes to see the skin of his castings; he admires the ruddy complexion; he is fond of rich tints and *no trimming*. The scratches of a file or the marks of a chisel on a good specimen annoy him as much as the "cats of Kilkenny" in chorus might annoy a nerve specialist.

Pickling.

Cosmetics and condiments are artificial commodities used by humans to counteract blemishes in their physical arrangement—so it is with "pickles" in the brass foundry! The sickly pallor of "leady-cock-metal" fittings, and the hectic flush of acidulated "coppery-steam-metal" parts, proclaim the art of the dyspeptic brassfounder who seeks to make old metals look new. As only a few of the alloys are really improved in appearance by an acid bath, I hold that the advantages of pickling are debatable—much depends on the pickle and the duty of the castings. With good metals pickling is an unnecessary process; with poor mixtures, it is sometimes an unfriendly one; and I make it a rule never to pickle castings intended for hydraulic tests.

Blowing out cores is another practice which is sometimes overdone. Unless with castings of about equal thickness, or with

intricate cores, the small advantage gained by being rid of internal dressing could be equalized by closer attention to the core sand and fettling departments, and the castings would be free from cooling strains.

I shall not weary you further with cursory comments on small, debatable matters. This hurriedly written paper, as I said at the beginning, was started with the object of throwing a few side-lights on the subject of successful brassfounding—they may have been only dim, uncertain glimmerings, but brassfounding being a dark subject, the smallest ray may be an illumination in itself. It has been my aim to show (1) that the discovery of bronze opened up the field for metal castings; (2) that no castings have attained to the eminence of the bronze castings; and (3) in order to become successful brassfounders you should honor the traditions of the trade (the chief one being "Take care of the metals; the molds will take care of themselves"), and be imbued with the belief that radium may come and steel may go, but bronze will continue forever.

Shows Good Workmanship.

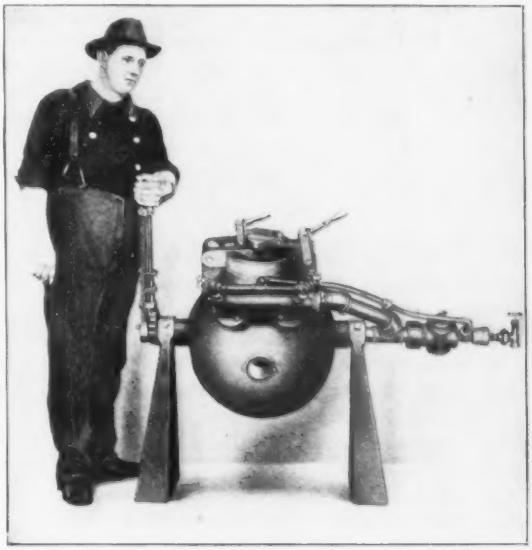
Some electrical machinery manufactured by the Westinghouse Electric Co. was recently put to a rather unexpected and unusual test in the basement of the New England building, of Cleveland, O. A fire occurred near the generators and completely burned away the insulation of the outside of the field coils. The fire department played upon these machines with six lines of hose for an hour, and within an hour from the time the water was turned off one of the machines was in operation, carrying its full rated load. The second machine was put in operation later and also carried its full load, and subsequently two of the machines were operated under the load normally carried by all three of them. The fire-proof insulation of the field coils withstood the fire perfectly, even though the outer protecting coverings were entirely consumed. The heat was so intense as to burn and blister the finish on the frames. This electrical machinery was not expected nor constructed to stand a fire and water test, but it seems to have successfully done so.

The Hennessy Foundry Co., of Springfield, O., will erect an addition to their pattern room.

THE NEW SCHWARTZ FURNACE.

All readers of *The Foundry* are familiar with the Schwartz melting furnace, made by the Hawley Down Draft Furnace Co., Chicago, Ill., but recently they have added a new furnace to their list which is interesting in many respects. Some of the larger sizes of their old furnaces have a capacity of as much as 10,000 pounds of metal per heat. The new furnace has a capacity of from 10 to 100 pounds of metal and will melt a heat every thirty minutes. It is shown in the accompanying illustration, and the size of the furnace can be judged by comparing it with the man standing at the side.

There have been some interesting tests made on the Schwartz furnaces recently at the Chicago, Rock Island & Pacific Railroad Co.'s shops, the results of which are printed below.



SCHWARTZ FURNACE OF SMALLEST SIZE.

The tests as recorded cover six heats of a varied assortment of car bearing metal. The test started at 7:25 and 46 minutes were taken in heating the furnace. The total amount of metal charged in the six heats was 2,345.5 lb. and the quantity received 2,288.75 lb., the total shrinkage being 53.75 lb. or 2.29 percent. The total amount of oil used was 65.83 gallons. Heating the furnace consumed 9.50 gallons and the amount per hundred pounds of metal melted was 2.44 gallons. In a fifteen day test with metal for car bearings the total amount melted, time and oil consumed, were as follows: Red

brass borings, 33,000 lb.; scrap car bearings, 60,900 lb.; crude oil burned, 1,680 gallons; total hours, 120; number of heats, 54; cost of fuel oil, $58; labor in melting, $37.50; cost of steam power, etc., $11; loss of metal, 3.7 percent; gallons of oil per hundred pounds of metal melted, 1.8.

Another test made with kerosene oil fuel was reported as follows: Time to heat furnace, 45 minutes; time to melt 500 lb. bronze, 1 hour; oil used, 11 gallons per hour; cost of oil, 9c per gallon; loss of metal, 1.9 percent. The total cost of six heats in ten hours, using oil only seven hours which includes the heating of the furnace, takes 77 gallons and was $6.93 for melting 3,000 lb. of metal. The use of kerosene effects a much greater saving therefore than may be obtained by either crude oil or natural gas.

A test of a Schwartz furnace in making steel castings involved the melting of 350 lb. of Stewart pig, 819 lb. plate scrap, 8 lb. ferromanganese and 40 lb. silico-spiegel, a total of 1,217 lb. The time from charging to tapping was 3½ hours and the crude oil used was 73.4 gallons.

THE WORLD'S FAIR AS A WOMAN SEES IT.

And now the Mining Gulch foundry is following popular custom and has "at homes" of afternoons and daily openings of blast furnaces and pours out warm liquids—really hot stuff, in fact—and makes beautiful mud pies and fills pretty sand molds with molten metal for the diversion of the ignorant public and the delectation of iron founders.

A tenderfoot wanders in because he hears a noise, and, seeing what is on hand, asks seriously, "When are you going to founder," and gets answered with equal seriousness that the chances are slim for the process to take place at all, owing to the restaurant prices, but he waits around on one foot to see if anything happens.

Over in one corner of the wide-roofed place with a dirt floor he sees a little steel, fire-clay lined furnace on wheels. It lies like a reclining barrel and has a lipped opening on one side, out of which rushes a fierce flame. He doesn't know but what the roaring thing is on the point of blowing up, but presses up close enough to get his eyebrows singed, so as to see it blow up if it does. He finds that the portable furnace is for the melting of small "batches" of metal and is used in foundries and machine shops and by general metal workers. Its fierce heat is generated by crude oil being fed in as a spray under the impetus of an electric-run fan, and it melts up piles of all sorts of metal junk with the indifference of a garbage reducer.

He sees the little furnace wheeled away and turned over above a row of cast-iron molds and out of it rushes a stream of fiery brass of water-like consistency that cools into yellow bars with coppery tints. Alongside the portable furnace a man is making the mold for a brass wheel, and in the making he demonstrates the workings of some new molding machinery. A sieve, vibrated by compressed air, sifts his sand; the same agency presses it about his model, and later gently jars it loose and obviates the old tedious method of "tapping."

Over at other similar machines other expert workmen are making sand molds for steam radiators, stove legs and other castings of various kinds, and scattered about the tenderfoot finds finished stove lids, stove doors and lid lifters, which he had somehow thought grew in hardware stores. He remembers a crippled lawn mower or a lame cultivator or a broken hinge at home, and wishes he had the things right there so they could be fixed.

But about this time his notice is called to the other side of the foundry, where they are working a machine that resembles a sausage grinder, and this he finds is making cores, and not knowing what cores are, he gets told they are made of a mixture of sand and flour and oil, and after being baked in an oven hard by serve to temporarily fill the castings that are to be hollow when finished.

Then a neighboring corner gets up a new noise, and he finds that a tall fire-brick lined "cupola" that is filled with alternate layers of iron and coke, with another ingredient or two, is being fired up, under the persuasive influence of a powerful steam-run rotary fan, and that men are gathering up various long-handled ladles and pokers and are sticking wads of wet clay upon the ends of wooden poles. Presently from the tiny clay-stopped doorway at the base of the tall cupola there spurts a shower of brilliant sparks that equal those of an exploded skyrocket in brilliancy. Then a man prods a small hole in the clay-plugged doorway and a little stream of molten iron rushes out into a ladle, while the use of the wads of clay becomes apparent, in that one of them is used to stay this stream and stop up the doorway again.

Into various molds and on to flat sand piles on the foundry floor the ladle is emptied and then refilled again, until the furnace is drained

of its metal, when its hinge base is unlatched and the slag and refuse remaining is dumped upon the ground and drowned into coldness by a stream of water. Since the iron is melted over again every day to show off the furnace, it becomes useless for good castings, so that ladles full wanted for real use have ingredients added, the name and use of which are known to foundrymen, although not to the unappreciative tenderfoot.

Every afternoon there gathers at the foundry exhibit a crowd of people who are attracted by the noise and leaping flame and spurting metal, and they stand around with their mouths open and walk pigeon-toed among the close-set molds upon the ground, or step right into some of them and spoil them, and then go away little the wiser. But among them all will probably be a dozen who are interested in the exhibit for itself and stay to hear all about the new style machinery or to take a ride in the cab of the 10-ton traveling foundry crane that sails back and forth on its tracks up aloft, and maybe they buy one like it, or order a cupola or two, or a half dozen mold-making machines to take home with them.

COAL AND COKE FOR FOUNDRY USE.*

BY PROF. BRADLEY STOUGHTON.

To understand the economical and industrial questions of melting with coal and coke it is necessary to know something of the nature of these fuels, and to know this means that we must at least know something of their origin and manufacture. Practically all solid fuels in use today have their origin in wood or in vegetable matter closely allied to wood. So little resemblance exists between coal and wood that we are all liable to forget that one is derived from the other. In fact, so great has been the change and so slow was the process that the wood from which our bituminous coal came grew, not thousands, but hundreds of thousands of years ago. Two conditions must have existed about the vegetable matter of remote ages which has been preserved to us in the form of coal. The growth must have been rapid and luxuriant, and it must have taken place in swampy or wet places. Doubtless trees grew in those times under other circumstances and conditions, but they have not survived in the form of coal.

Wood exposed to the air will rot away with time. We know, therefore, that these ancient forests which have supplied us with coal, must have been protected after the trees fell to the earth. Such protection they could only have had in one of two ways. First, they must have fallen into the water, and second, a new growth of trees grown up, lived, died and fallen over the first growth before it had time to decay. In this way several generations of trees must have followed each other, for some of the beds of ancient timber could not have been less than 300 feet thick.

Next a second change took place in the conditions, so as to continue the protection of this wood for many future centuries. Mother Earth is never entirely quiet. Sometimes her changes take place with great violence, like Mt. Pelee, again they may be so slow as not to be perceptible to any but the most careful observers. Such changes are principally variations in elevations where some places are always rising and others falling. Now the swampy land on which our beds of wood grew must have been lowered sufficiently for dirt and gravel to be washed on top of the wood by brooks, streams, or rivers. This dirt was cemented into stone in the course of time and now the trees are wrapped up in storage and preserved from actual decay for ages together. However, some change did occur. Wood consists principally of three chemical elements, carbon, hydrogen, and oxygen. In the course of time some carbon acted with some of the hydrogen to form a gas and some of the hydrogen acted with some of the oxygen to form water. Part of these remained in the wood, but part was squeezed out by the great pressure of the overlying rock. The result was a great increase in the proportion of carbon in what was left. Now carbon is usually black in color. Lamp black and graphite are common and well-known forms of it. It was only a few years, about a million or so, before the wood had been reduced to almost pure black carbon, containing still some entangled gases. This is our bituminous coal.

There are very important differences between bituminous coal and anthracite. Bituminous coal contains about one-third of its weight of enclosed gas, while anthracite contains almost no gas, or volatile matter. Anthracite is bituminous coal which suffered a

*Paper read before the New York Foundry Foremen's Association, Oct. 1st.

Note by the Editor.—This paper was illustrated by experiments and lantern slides and hence only a portion of its interest can be conveyed in printing, but nevertheless we feel that it contains much that will be of interest to foundrymen.

still further change. The heat of the earth which is always present at considerable depths, with the pressure of the overlying rock, has driven almost all of the gas out of the bituminous coal, thus forming the anthracite, which, as we all know, is very firm and compact, in other words, nature has made anthracite out of bituminous coal.

Man makes coke out of bituminous coal and it may be interesting to compare man's work with nature's work. Nature drove out the gas by means of a little heat and great pressure. Man uses great heat and no pressure. Nature's work left a close and compact product. Man's work leaves an open and spongy product. Coal alone is not used to any great extent, I believe, in melting iron. Coal mixed with coke is not uncommon. It is the difference between this mixture and coke alone, which is, of course, the commonest method, and it is that which I shall discuss.

Coke is a spongy mass,—that means that the same weight of coke will occupy a greater bulk than a corresponding weight of coal. It means that coke offers less resistance to the air, so that with the same pressure we get more wind through the cupola, which means faster melting. It also means that the coke offers more surface to the air and hence burns faster, which means that we should get a higher heat theoretically. Actually, however, you can get a much higher heat in your cupola by mixing coal with coke, though the melting will be slower and the process more expensive.

Except in cases where it is desirable to get the iron very hot, it is better and cheaper to give the attention to careful cupola work and use coke alone. With mixed coal and coke a lower blast pressure should be used. Some use coke for the regular melting, but anthracite coal for the bed. This is a very expensive and wasteful method. Many persons put a shovelful of coal on the side of a cupola when a little accretion starts to form. This is a good practice, as it raises the heat at the required point, thus melting off the accretion. Bituminous coal is better for this purpose than anthracite, on account of the fact that the flame from the gases will seek out places that the heat from the anthracite coal could not reach.

Bituminous coal is used for melting iron in air furnaces, on account of the fact that it has a long flame.

The lecturer then explained the difference between beehive coke ovens and by-product ovens, showing lantern slides of the different types and describing the operation. He also dwelt at some length upon the use of by-product coke for foundry purposes.

CASTING OF IRON.*

BY CHAS. H. THOMAS.

The speaker exhibited a few samples of cast iron made from the same mixture, but several days apart, to show how uniform the mixture had run. His remarks were substantially as follows:

We all know that for the production of good castings we must have at the start a good cupola, a good blower, good fuel, good iron, a good melter, a good pattern, a good flask, good sand, a good molder, and a good foreman. We might add, a good firm, but this goes without saying. The cupolas should be built of good material, and not thrown together, as is the case with the "manufactured-while-you-wait" article. All rivet and bolt holes should be countersunk on the inside of the shell and the tuyeres made so as to avoid the cutting of the firebrick or blocks. The cupola should be so designed that the lining when new will conform to its shape after it has burned out by continued use. My experience has been that the blast striking against the fuel is to a certain extent deflected from the center of the cupola and finds an easier course along the firebrick lining. This causes the firebrick to wear out quite rapidly, particularly if there is much slag. Slag formed in the cupola seems to have a great affinity for the firebrick lining, and if there is a strong blast, it simply devours the lining.

In the McKenzie cupolas the tuyeres were carried toward the center and gave very good results when burning lump coal. These cupolas were not rapid melters, but the iron came very hot. I have used coke and Lehigh coal mixed in charging them, but never tried to run entirely with coke, so cannot say what the results might have been in such a case.

The bricks or blocks can be kept close together where there are no bolt or rivet heads to interfere and this assures a longer life to the lining. I use a mixture of one part fire clay, or kaolin, and three parts of No. 3 Jersey molding sand as a thin mortar. It stands the extreme heat better than the fire sand. I also use the No. 3 sand to make up the breast.

*Paper read before the New England Foundrymen's Association at its October meeting.

I try to melt as hot and rapidly as possible, as the saving of time in molding is quite an item, and the addition to the daily output one of the vital points in reducing the cost of production. This can readily be accomplished by the foreman if he goes about the matter systematically and uses tact and diplomacy with the men. The success of the transaction depends upon how well posted each may be. In the larger shops where most of the casting is done after the molder leaves the shop, the overtime of the helpers assisting in the casting can by rapid melting be reduced to a minimum. We have just installed a new positive blower which enables us to cut off one-third of the time previously taken in casting. We have discarded overtime for all but four helpers and two crane operators, who remain to take off the weights and break the bad castings that accumulate from time to time.

We believe that when we get a good mixture it is best to stick to it as long as we secure excellent results. Our castings vary from ⅛ in. to 2 in. or more in thickness and are principally ornamental, stair, jobbing and column castings. Our test bars are 1 in. square and 14 in. long, 12 in. between bearings, and break at from 2,800 to 3,300 pounds. It has been our experience that it is better to use all agricultural or railroad scrap in forming a good mixture. We then keep the silicon and other components more uniform than by buying any or all scrap that comes along. By keeping to one kind of scrap, we soon find out what pig iron is best adapted to our work, and when this has been accomplished we are ready to make castings with the above mentioned variations in thickness. The only time that we have trouble with hard castings is when there is a change from one kind of scrap to another, or a change in pig iron. Our mixture stands acid and heat tests that are very severe. Sometimes when a casting is of a peculiar shape we either add more pig or leave it out entirely. Some particular castings require very soft iron and then we use 50 percent each of pig and scrap, though this mixture is too rich for our general run of castings. When the gear arms are light and the rims heavy we may find large shrink holes on cutting into the rim. These holes are due chiefly to too much silicon and graphitic carbon, the graphite being quite apparent. The writer exhibited a piece of a flange of a high silica casting cast from a mixture containing 20 percent pig and 80 percent scrap, the grain being very open. He stated that there was a slight defect upon this casting, and that they attempted to burn it with the same mixture and found it so hard they could not machine it. From experience they had learned that to make a burn properly they have to use a much softer mixture than that used in the original casting. It is also necessary in making a burn to use an iron that will shrink but very little. The writer says that he does not recommend the use of as much scrap as 80 percent and that there are few pig irons which are good scrap carriers and many pig irons which require doctoring. The only way to arrive at an ideal mixture for your work is to experiment with one grade or class of scrap iron and three or four brands of pig to select from, until you have reached the desired results. He stated that much of the trouble which arises in foundries from the indiscriminate use of pig iron may be overcome by using a considerable quantity of good scrap as a physic.

After overcoming the troubles arising from the iron there is yet one point in the production of good castings to be attained and that is, that the metal must be poured into good molds. You may have to make many changes in molders, but there is one advantage on your side, and that is, that you can instruct the apprentices in just the manner you wish to have them work. Keep your apprentices interested in their work. Be liberal with them and keep them advancing. As fast as they master one part, push them along to another, for they will be the future casters of iron.

Those who generally keep a boy on one piece or class of work from one year's end to another are the ones who deplore the scarcity of good molders.

The Davis Car Foundry, of Waukegan, Ill., has decided to build a plant at Grayslake, where it has purchased five acres of land and broken ground for the first building.

The Kentucky Foundry & Machine Co., Eddyville, Ky., has been incorporated with a capital of $15,000. Incorporators are: J. B. Girdler, A. N. Webb and J. W. McMullen.

The Memphis Brass Works, of Memphis, Tenn., which was established nine months ago, have met with such success that they have been forced to increase their capacity. They have secured a lot 50 by 100 feet, upon which they have constructed new works. The works are under the management of Mr. J. S. Lightburne.

SYSTEM IN THE FOUNDRY.

BY P. R. RAMP.

In order to successfully and intelligently manage a foundry I consider it essential to have a *daily foundry and labor report* similar to the one shown in Form 1. This report should show the quantity of each kind of iron melted, also the coke, flux and other material used in melting. These items should come under the head of iron melted, as shown in the upper left hand corner.

The center column under the head of cupola practice should furnish a record of the same.

The column under the head of results, located in the upper right hand corner of the sheet, should give the total pounds of good castings, defective castings, gates and over iron, returns from bottoms and loss in melting. This total should agree with the total iron melted, the difference in weight being the loss in melting.

The next item is the labor report, giving the number of men employed in each department, the next the miscellaneous supplies report.

Items of importance are as follows:

Good castings per floor, good castings to heat, and loss to heat.

The report of iron melted and coke used is taken from the cupola charging report, which is shown at Form 2. Each charge of iron and fuel should be carefully weighed. The gates, over iron, and bad castings should be charged under the head of foundry scrap G. & O. The returns from bottom should be charged under the head of Foundry Scrap Returns.

A daily bad casting report should be made out by the foreman in the chipping department, and the total weight of bad castings should be deducted from the total pounds of foundry scrap G. & O., and entered on the sheet opposite the word defective. This plan is more simple than to weigh and charge the bad castings separately into the cupola.

As it is absolutely necessary to have weighed and melted all the gates, over-iron, defective castings and returns the day after they are produced in order not to be behind with the report, the foundry foreman will be compelled to keep his shop clean, in order to turn in an acceptable report. If he does not account for all of his foundry scrap on the following day, his loss in melting will show too great on his report, as this foundry scrap represents a

DAILY FOUNDRY AND LABOR REPORT

SHOP _____ DATE _____

TO BE COMPILED DAILY

SUPT. ○

CORRECT ○

IRON MELTED		CUPOLA PRACTICE		RESULTS	
Pig	Lbs.	Lighting	O'clock	Good Castings	Lbs.
"	"	Loading Commenced	"	Defective	"
"	"	Blast on	"	Gates and Over Iron	"
Foundry Scrap	"	Bottom Dropped	"	Returns from Bottom	"
Railroad Scrap	"	Ratio Lbs. Iron to	Lbs. Fuel	Loss in Melting	"
Misce. Scrap	"	Good Castings, per Floor	Lbs.	Total	"
Total	"	Good Castings, to Heat	%	R. R. Castings	Lbs.
Coke	"	Loss to Heat	%		"
Manganese	"	Remarks			"
Limestone	"				"
Wood	Cords			Total	"

LABOR				MISCE. SUPPLIES
Moulders		Carpenters		Coke for Ovens
" Helpers		Pattern Makers		Coal
" Apprentices		Machinists		Moulding Sand
Machine Operators		Blacksmiths		Core Sand
Coremakers		Engineers		Fire Clay
" Helpers		Yard Men		Plumbago
" Apprentices		Pattern Clerks		Flour
Cupola Men		Teamsters		Nails
Chippers		Shippers		Rod Iron
Drop Men		Flask Maker		Lumber
Flask Men				
Laborers				
Night Men		Foreman		
		Total		

The Foundry

FORM 1.

part of his production, and must show under the head of results.

A report of this kind is not only a check on the foundry foreman, but it is also a check

DAILY CUPOLA CHARGING REPORT.

SHOP DATE

NUMBER OF CHARGE	Limestone	Manganese	No. 2 Car 53967	No. 3 Car 13747	No. 2 Jahn Car 25761		R. R. Scrap	Lot O	Pittsburg		COKE	TOTALS
1												
30												
31												
												FOREMAN

The Foundry

FORM 2.

on the man on the charging floor, and experience has taught us that the man on the charging floor will sometimes bear watching. Very often this man will receive orders from his foreman to charge say 35 tons into the cupola, but he remembers the day previous he charged 35 tons according to the foreman's orders, and had to drop over two tons. A heavy drop is very distasteful to a cupola man, and to avoid the additional labor required in clearing away a heavy drop, he has been known to leave out one or two charges unknown to the foreman, at the same time putting the required number of charges on the charging sheet. In ordinary cases this trick would not be detected, but in balancing the daily foundry and labor report, a heavy loss in melting will be found, and when the weight of castings produced has been proved, and it is evident that all foundry scrap has been delivered to the charging floor there will be evidence enough to convict Mr. Cupola man.

The daily foundry and labor report under

MOULDING ROOM REPORT 190

ORDER NO.	NAME OF MOULDER	HOURS	KIND OF WORK	PAT. NO.	NO. IN A FLASK	NO. OF FLASKS	TOTAL

The Foundry

FORM 4.

the head of cupola practice gives us the melting ratio. If it is noticed that we are using too much fuel per pounds of iron melted, we glance over the record, and see what time was consumed between lighting and loading commenced. It sometimes happens the cupola man will allow his bed to burn too long before loading is commenced; in doing this he consumes more fuel than necessary, and under such conditions it is necessary to use a greater quantity of fuel between the charges to make up for what he has wasted of that on the bed by lighting up too soon.

Another check on the melting ratio is the time consumed between blast on and bottom dropped. If our *tons per hour* do not show as well as usual and we have the same grade of coke and iron, and the blowers are in good condition, it is generally safe to conclude we are using too much coke for fusion and the extra time is required in consuming the surplus coke between charges. After studying our report carefully we cut down our coke charges accordingly.

The next important item on this report is good castings produced. The chipping foreman

CASTINGS MADE.

SHOP DATE

Quantity	ARTICLE	ORDER NUMBER	WEIGHT	WEIGHT
	TOTAL,			

The Foundry

FORM 3.

must weigh every casting that is made (unless he has the weights of standard pieces) and put the same on the [castings made] blank Form 3, which shows the quantity, articles, order number and weight. If the shop is making a specialty of some certain class of work the same can be bunched and weighed in truck load lots. It is not necessary to show the order number except on special castings where an individual cost is required. If the cleaning department is properly arranged, weighing of castings will not require any additional labor, and gives a correct record of castings produced monthly or yearly, and is essential in figuring up the costs. It is also valuable as an inventory, as the castings produced, less the castings shipped, represent the castings on hand at any date an inventory is wanted. When we have the weight of castings produced it is a simple matter to

get the good castings per floor by dividing the total castings produced by the total floors in operation. If we find the weights per floor is not showing up as well as it should, we look

BAD CASTING REPORT

DATE _____ SHOP _____

AMOUNT	NAME OF CASTING	PAT. NO.	CAUSE	MAN'S NAME	OCCUPATION	WEIGHT

TOTAL WEIGHT _____

The Foundry

FORM 5.

over the molding room report to see whether or not the work is running as heavy as usual. Molding room report is shown in Form 4. This report is valuable in figuring up individual cost of molding, though not as good as the time slip, but as the labor organizations often object to time slips on piece work, the molding room report must be used as the next best thing.

In a shop making from 40 to 50 tons of castings daily with 80 molding floors in operation, this report can be taken up in one hour.

The good castings per heat is important. To determine this we must get the percentage of good castings of the total iron melted. There

FOREMAN'S ORDER BLANK

Date_____

DISTRIBUTION NO.	QUANTITY	SPECIFY DIFFERENT ARTICLES WANTED HERE	HOURS

FOREMAN_____

The Foundry

FORM 6.

are several things that govern this percentage. One is the defective work which is weighed daily by the same man that weighs the good castings and reports them on bad casting report shown in Form 5. This report shows the name of casting, pattern number, cause of loss, loser's name, loser's occupation and weight. This report is also beneficial in keeping a man's record.

Another cause for a low percentage of good castings is light work, as light castings require just as many gates and often more than heavy ones. The consequence is, on a heat of light work the gates produced will run very high, thus cutting down the percentage of good castings. Another cause is over-estimating by the foreman in taking up this heat. If he drops 3 or 4 tons daily, every heat he melts 3 or 4 tons more iron than is necessary, which reduces his good castings per heat, to say nothing of the fuel wasted and labor required to remove the drop the next morning. Hence this is a check on the foreman's ability to correctly figure out his heats. The loss of heat is governed as stated before by our accurate weight of all castings and foundry scraps produced, and an accurate weight of iron melted.

FOUNDRY PATTERN CARD.

FOR _____ ORDER NO. _____

MOULDER'S NAME.	MOULDER'S NO.	DATE
NAME OF CASTING.	PATTERN NO.	NUMBER WANTED

DATE CAST																								
NO. CAST																								
NO. BAD																								

The Foundry

FORM 7.

The labor account should be kept in time books by each foreman, and after they are checked with the time clock the distribution of labor in them would be of value to the man in charge of the cost sheet.

The miscellaneous supplies should be issued by the storekeeper upon receipt of a foreman's order, as shown in Form 6. This order should be preserved for the cost sheet man. The work on this report required, to my knowledge, one and one-half hours every morning for one man, and would be cheap if it required 10 hours, as it is not necessary for the manager or the foundry foreman to wait until the monthly costs are figured up to be able to know whether he is progressing or going backward, because he has a daily report that gives in detail the results of the day.

SOFT FOUNDRY ORDER

For _____ Date _____

Order Number	No. Wtd.	DESCRIPTION	Pat.		NUMBER MOULDED OR SHIPPED
				Daily	
				Total	

The Foundry

FORM 8.

Aside from intelligently managing a foundry, this report is valuable in getting the cost per ton of every department.

Where two or more foundries are operated

by the same company, it is an ideal comparative statement.

Aside from the daily foundry and labor report I want to mention the foundry pattern cards. Form 7.

Orders on the foundry are issued from the general office on order blank (Form 8) in triplicate—one to the shipping clerk, one to the foundry foreman and one to the pattern clerk. One-half of this sheet is laid off for a checking sheet for this shipping clerk. The pattern clerk transfers all items from this order to his pattern cards, using a separate card for each item. These cards are tacked on each pattern, and laid out for the foundry foreman. The date is stamped on the card the day the pattern is tagged. The molder that receives the pattern puts his name on the card and a record of his work.

When the order is completed the card is again tacked on to the pattern, and the man in charge of that work returns the pattern to the storage and delivers the card to the foundry office, where it is stamped *date received*, and filed in a box for that purpose. Each one of these cards represents the history of the pattern it was attached to, as follows: When it was marked up; when it was molded; when pattern was returned; the number defective.

If an additional order is received before the first one is completed, the molder is given another card.

SLAG IN CASTINGS.

BY WM. LEARY.

When one examines a scrap heap he will find that the largest percentage of loss is generally due to slag in the castings. Castings suffering from this complaint have a pock-marked surface or little pits over the surface. These usually show above the gate on the outside and sometimes below the gate. In the case of hollow cylindrical castings, the inside bottom surface of the cylindrical opening is often badly marked, especially when they are poured in a horizontal position. Slag also frequently collects along the top of the casting on the outside. The position in which the slag is found in the casting varies with the form and thickness of the casting and with the fluidity of the iron. Occasionally we see castings which show a series of small holes on the outside, some no larger than a pin point, while other castings have a honeycombed appearance and a graphite or black lead look. These are usually erroneously included under the same heading. Slag will never make a clean hole through a casting, but kish and gassy iron will do so.

The cause of castings containing slag may be summed up as follows: First, dirty iron whether hot or dull; second, dull clean iron, in the case of castings which are improperly gated; third, a run out, or in short anything that will cause a casting to empty its pouring basin or runner while in the act of pouring, with the result that the slag is washed into the casting.

While it is an easy matter for the average molder to throw the blame for each spongy casting on to the iron served out to him, nevertheless, occasionally he is right in this accusation.

The writer has seen iron come from the cupola at a white heat and very fluid, which, when poured into a thoroughly dry hand ladle, would be all of a dance, but with a light reddish dross or scum on the surface, which would enter the casting in spite of the skimmer, swirl gates, or anything that the men could devise. Nevertheless, in some cases the casting would be quite strong under the hammer, though the fracture would show clean holes running through the thickness of the metal, and unless one knew the difference he would blame ventless cores. In a case of this kind, where the heats have been satisfactory before, you should not blame the molder or coremaker, but pay your attention to the pig iron you used that day, and as you do not use one kind alone, it should be an easy matter to discard the one that gives the trouble or to work it into castings where a few slag holes will do no damage.

The remedy for kishy iron is also at the cupola. These difficulties of slag holes and kishy iron seldom occur in a foundry where a mixing ladle is used in front of the cupola. This naturally suggests the cause, which will be found in irregular tapping. The man in charge of the furnace is frequently afraid that his tap hole will freeze up and consequently he taps out a ladleful of iron just as quickly as he can at the beginning of the heat, and in fact makes the first several taps in rapid succession. The consequence is that the iron is more or less irregular, on account of the fact that it has not had an opportunity to mix in the molten state. The same result will occur at the last few taps taken from the furnace.

My explanation of the matter is that during the central portion of the heat, when everything is working smoothly, the melter holds more of a body of metal in the cupola, but at the beginning and end of a heat, in his anxiety

he taps out small ladlefuls as fast as it accumulates. The remedy for dull iron is often not to monkey with the fuel ratio, but to look after the method of charging and the brand of iron used, to see that the whole is suitable for the work in hand. I would sooner advise the waste of a little fuel than the waste of a good many castings. The latter is certain to be the result of a penny-wise and dollar-foolish policy.

It is a most singular thing to me that one of the most important aids to good castings should be left to the tender mercies of the patternmaker or machinist, who frequently has no thought of the welfare of the piece work molder or the least idea of what is required in the gating of the patterns. Hence he puts on the gates to suit his individual taste, and the result is that the boss sand rat and the boss wood butcher are at loggerheads most of the time. They never speak unless they are obliged to. The gating of castings belongs to the foundry and the foundrymen should at least have the say in it. Where molders cut their own gates and get a large quantity of slaggy castings, this should be looked into and the man and not the metal should be blamed. If he continues to produce a large percentage of such castings, he should be furnished with gate patterns.

On large work a badly gated pattern which is difficult to change can be made safe by using a sprue pin having less area than the gate, and for work not exceeding 300 pounds a sprue pin not more than ¾ inch in diameter will be found plenty large enough. If you are used to big sprues it may pay you to try one ⅛ inch less in diameter on the last one or two molds made in a given day's work. If these are found satisfactory, a smaller sprue can be used on the molds the next day, except the last one or two, on which the sprue can be reduced ⅛ inch more. By continuing this process, you will find the smallest sprue which will do the work satisfactorily. The sprue should be of such a size that it will choke up instantly and hold a pouring basin full of metal until the casting is all poured. The remedy above mentioned will help any one who is not an expert in pouring, on account of the fact that it will check the flow of metal and enable him to empty the ladle quickly and at the same time not have the metal draw away in the pouring basin, on account of slight irregularities in pouring.

One very important point in pouring is to lower the lip of the ladle as close to the mold as possible and wait until the metal is still before one begins to pour. If it is necessary to pour a 215-pound casting from a ladle containing 200 pounds of iron and one wishes to do a safe job, the following method should be employed: Start pouring with the large ladle and then have some one pour the additional 15 or 20 pounds into the large ladle from the hand ladle while the pouring is in progress. This will enable you to hold your pouring head or basin full at all times. Where an attempt is made to pour one ladleful in and then follow up with another, you are almost sure to wash the slag into the mold. Too many men will use one ladle after the other, wash the slag in, and then look at the casting the next morning and say "There is some more of that darn chemist's iron." The remedy for slag in castings because of run outs, metal oozing out around cores or finding its way into the cinders, etc., so as to draw the slag from the pouring basin, must be supplied by the molder. In other words, he must stop off the space around cores and make everything tight, so as to guard against run outs and leaks of all kinds. If the core is too little, he must ram over or paste his prints. He must also plug or have plugged all exposed fins or cracks.

To sum up the slag castings question, the remedies are, first, purchase good iron, good fuel, and use enough fuel to bring down liquid iron. Second, if long heats are being run, slag the cupola by the use of flux. Third, look after the molder and see that he has his molds so made that they will not leak and that they are properly vented. There is no skimmer invented like a thick coating of slag on top of the ladle of iron while pouring. This shows plainly that slag in a mass will not pass into the casting, and cause spongy iron, but that it is the finely divided slag that must be avoided.

ADVANTAGES OF THE ALL ROUND MOLDER.

BY JOHN SWAIN.

Foundries that are regularly manufacturing repetition castings, that is, castings of which a large number are required, from one pattern, and especially those who are doing fine or highly finished work, have found that it pays them to have castings dressed before they leave the molding department, the dressing being done by the molder himself. At least, my knowledge of foundry work leads me

to believe that the above statement is true. My firm employs from 250 to 300 hands on fine, light, repetition castings. Each molder is allowed 8 or 10 boxes (flasks) just according to the size of the casting that he is making. These boxes are so designed that the sand room in them is cut down as much as possible. There is no expense spared in the fitting up of the boxes, and they are made so that the various parts are interchangeable with one another for each separate design.

The molder first makes up as many molds as he has boxes. In some cases this may be done in from 15 to 30 minutes, all depending upon the pattern he is using and the amount of finishing he has to do on the molds. He next gets his ladle or shank, which is made to hold about 35 pounds of molten metal, obtains his metal and pours his molds. Almost as soon as he pours the last box the first one is ready for stripping and he at once attends to this, taking care to stack his boxes close to his pattern so as to reduce handling. If the boxes are not shaken out immediately, they will get hot and this will increase the chances of a mold dropping when ramming them up again.

While his boxes are cooling to their normal temperature, the molder gets his tongs and hammer and commences to knock off the sand from his castings and at the same time he is practically dressing the pieces. It is well known among foundry managers and foremen that the molder after casting is always anxious to look for something that he does not want to find, that is, a bad, blown, scabbed or faint casting, and while he is doing this, he can just as well as not run his hammer around the joint of his castings. After this rough dressing he will know whether his castings are good or not, and if he is paid by the piece, is sure to go at the next lot of molds in a more contented frame of mind, since he has the knowledge that he has to his credit a certain number of good castings.

The molders also employ boys which they call "scratchers off." One boy works for five men and each man pays him out of his piece work price 2 shillings for all the work he does during the week, much or little, but the molder takes good care to see that it is much. These boys rub or scratch-brush the sand from the castings.

The molders cease work one hour before the regular works' time, thus allowing them plenty of time to clean up their benches and space. It also allows time to go over the castings with a file and to chip off the gates, etc. Another advantage of this early quitting is that it gives the furnace man time to cool his furnace down before leaving. All of our molders are provided with shovel, bellows, blacking bag, hammer and chisel, ladle, and a certain amount of room which they must keep clean, free from scrap, etc., and the necessary number of boxes. One of his duties is to keep his space clean and neat and the piece work price is fixed accordingly. He also has to deliver his castings to the inspector in the warehouse. After the castings pass through the hands of an inspector, they are credited to the molder on the books.

The above system once installed will be found beneficial to the welfare both of the molders and of the firm.

Among the difficulties that are avoided by this system, we may mention the following: When a man is casting light or difficult work, and has a bad casting on account of the iron not being hot enough, he will claim the casting is on account of bad iron. Also, if through the carelessness of the casting cleaner or dresser, any of the castings are broken, even though the breaking may have been done by chipping off lumps caused by careless molding, the workman will still claim that the broken castings are the fault of the cleaner. In other words, this system avoids an endless number of controversies between the casting cleaners and the molders. Also in a dressing or cleaning department there is usually a great deal of breakage due to the careless handling of castings, and this in many cases after the castings have been inspected by the inspector. This loss to the firm may be avoided by having the molder clean his own castings, on account of the fact that he will be much more careful in the work, due to his personal interest in each piece.

Any one who has not watched these losses very carefully will have no idea of their magnitude, and the importance of curtailing the loss as much as possible. Frequently the losses from broken castings in the cleaning rooms may increase the cost of castings from two cents to twelve cents per hundred pounds, and it is certainly worth while considering how such a saving as this can be made, as it is these little savings that enable the firm to pay dividends.

The Hydraulic Press Co., Gilead, O., has purchased the old Ripple Foundry plant, which adjoins its property.

METALS IN FOUNDRY PRACTICE.

Devoted to inquiries from Practical Foundrymen on subjects relating to the Melting and Using of Cast Iron, Steel, Brass and Bronze.

The following experts answer questions in this department:

W. J. Keep, Cast Iron.

J. B. Nau, Metallurgy of Steel and Steel Castings

Dr. Richard Moldenke, Malleable Castings.

C. Vickers, Brass Castings.

We have also made arrangements with several others to act as special contributors upon Brass, Bronze and other subjects. All inquiries should be addressed to the Editor of THE FOUNDRY, and they will then be forwarded to those in charge of the different subjects.

CAST IRON NOTES.

BY W. J. KEEP.

To Prevent Iron Patterns from Rusting.

If exposed to the atmosphere for some time rusting of the surface of an iron pattern will produce a very rough surface.

Black shellac varnish protects the surface. At least once a year the pattern should be thoroughly sandpapered and revarnished. This treatment is especially satisfactory if the patterns contain solder or beeswax.

Patterns that are smooth and have not been soldered can be heated and rubbed with beeswax and brushed with plumbago.

Bayberry wax is cheaper and better. It takes several days to prevent sand and facing from sticking to such patterns. By wetting a bright iron pattern and leaving it over night to rust, then brushing and molding from it and brushing after each mold until a bright oxidized surface is formed is probably the best treatment. Thorough brushing by the molder will keep the surface bright and smooth. Occasionally a little bayberry wax rubbed on the brush before brushing the pattern will help protect the surface.

Especially should this latter be done before the pattern is put away for any length of time and a pattern should never be left in a foundry when the air is moist.

Sand Consumption in a Stove Foundry.

To make one ton of finished stove castings uses 444 lb. of sand. This was found from the total pig iron and sand used in one year.

In a stove foundry the finished castings are about 60 percent of the iron melted; therefore, for each ton of iron molded, including sprues, 288 lb. of sand are used.

Scroll Ornamentation for Furnace Patterns.

For first class patterns, both stove and furnace, it is usual to glue on the surface of the pattern a thickness of pine equal to the thickness of the carving and then to carve the design without going through the glue and then back out the back of the pattern.

The ordinary imitation carved ornaments pressed out of wood or a preparation of sawdust and glue could be used but could not be backed out. These can be purchased at any store keeping supplies for furniture makers.

The old way was to press into dies the putty used by picture frame makers; as this was made of glue and whiting, by moistening the back the ornament would stick to the pattern. Very little backing out could be done.

The Best Mixture for Making Kettles for Melting Lead.

These kettles are 11 feet diameter, 4 feet deep and vary in thickness from 2½ inches at the rim to 3¼ inches at the bottom.

These kettles are used in melting and refining lead by the Parks process. The object is to separate the silver as well as to refine the lead. As there is a considerable percentage of sulphur in the lead ore the pot should absorb sulphur as slowly as possible. The iron from which the pot is made should contain the largest possible amount of graphite and the smallest percentages of combined carbon, silicon and other elements.

Making Chilled Iron Car Wheels from Iron Melted in an Air Furnace.

An English founder wishes to know if this has ever been tried. Probably it has, but the effort is to use methods of manufacture that will produce a chilled car wheel of the required quality at the least cost.

As it costs at least three times as much to melt iron in an air furnace as in a cupola its use would not be practical.

The sulphur absorbed from the coke in a cupola is not objectionable if it is not above 0.10 percent in the wheel.

Loss of Iron in a Foundry.

It is necessary to take in quite a period, say at least a week and better a month. All scrap and pig put in the cupola and all castings and scrap that come out of the cupola must be accurately weighed. Exercising the greatest care some iron will slip by on ac-

count of carelessness or in the slag. You must not estimate anything. When you get through you will not be sure of correct results. The loss will never be less than 4 percent of the iron charged and will often reach 8 percent.

The greatest care should be taken to prevent loss, but it is nearly impossible to determine the loss.

Formula for Dry Sand Rolls.

The sand must contain more binder than for green sand work. Sand suitable for dry molds can be purchased or a mixture of molding sand and river sand, say 4 to 1, and one-third as much sea coal as river sand. Mix with clay wash to give the bond.

Give the work to a molder that understands dry sand molds, as they are different from green sand molds.

BRASS FOUNDRY NOTES.

Dye House Rolls.

Inquiry. I should like to know the composition of a brass mixture for rolls and other parts used in dye houses where they come in contact with weak acids.

Ans. For a soft mixture use 16 pounds of ingot copper, 3 pounds of lead, and 1 pound of tin, taking care to stir the metal every two or three molds.

For a harder mixture use 77 pounds of ingot copper, 15 pounds of lead, and 8 pounds of tin. This alloy will also require thorough stirring before pouring each mold.

Another good alloy is copper 80 pounds, tin 10 pounds, lead 5 pounds. All alloys containing copper will be acted on by acids. Any good gun metal, minus zinc, will give as good results as can be expected.

C. VICKERS.

Melting Aluminum Chips.

Inquiry. We have had trouble in melting aluminum borings and turnings. The metal obtained from them seemed liable to blow holes, was impure and gave more or less trouble. We should like to know how this work can be done.

Answer. In almost all cases when the pot of aluminum has been melted and brought to a uniform temperature it is above the casting point and hence has to be cooled. The chips can be worked in at this point by placing a small amount in each pot full of metal, taking care to have the chips bunched together as compactly as possible, and also plunging them below the surface of the metal as quickly as possible. In this way they will assist in cooling the pot of aluminum, at the same time they are melted into the bath.

Casting Brass Liners on Propeller Shafting.

We have noticed with great interest in the October issue of *The Foundry* an article on casting brass liners on propeller shafting, by A. Urquhart. We have had a very large and extensive experience in the manufacture of brass propeller shafting liners, both cast on to the shaft and cast separately, then bored out and shrunk on, but we have never been absolutely sure that liners cast on the shaft, especially on steel shafts, would be sound after machining, as certain qualities of steel appear to give off a large quantity of gaseous matter as soon as the shaft is surrounded with the molten metal. This gas always causes a greater or less number of blow holes all through the brass liner. In order to prevent this as much as possible, we use a good yellow brass with a small proportion of tin, but then this is not an absolute cure and as we prefer to cast our liners of a gun metal containing from 7 to 10 percent of tin, we now invariably cast the liners separately and then shrink them on the shaft.

We would be interested to know if the author of the above mentioned article has been able to eliminate this risk of blow holes and if so, what method he adopts, also the composition of the metal that he uses.

STEVEN & STRUTHERS.

Pickling Castings.

In the June *Foundry* we published a review of an article in *Stahl und Eisen* by Mr. J. L. Eckelt, in which he described a method of pickling large castings by placing them on stone tables covered with sheet lead, pumping acid water into an overhead tank and allowing it to descend upon the castings in the form of a fine spray, also spraying the acid on from the sides. The surplus acid collects in the tank and is pumped up again. It was stated that the castings were treated for 48 hours, after which they were washed with clean water and then removed and left to stand in the open air for two days, when they would be covered with an even layer of brown. In commenting upon the article we said that over here we would hate to give that amount of time to cleaning the castings, unless the machine shop was far ahead of the foundry. We also made the remark that unfortunately

the method was not compared with the tumbling barrel.

We have received a letter from Oscar Leyde, of Berlin, from which the following facts are taken. The method of pickling described in the review was that used in the foundry of Ludw. Loewe & Co., of Berlin, Germany. This plant was described in the January number of *The Foundry*, the article being reprinted from one written by Oscar Leyde and published in *Stahl und Eisen*. Mr. Leyde states that in 1879 when he visited this country he found the pickling method in use in some prominent American works, and adopted the same for the Loewe foundry, of which he was then superintendent. The following explanation is given practically in the words of Mr. Leyde:

Of course you are right to ask for a reasonable explanation if you find any new novelty in the foundry, and it may be interesting to some of your readers to look up this method of cleaning a little more thoroughly.

Without mentioning the cleaning with pneumatic or hand chisels, with gate cutters, emery wheels, etc., there are two methods of cleaning castings, the mechanical and the chemical. The mechanical cleaning is effected by tumbling barrels of different sizes and construction and by sand blast apparatus. The chemical process is by the use of sulphuric acid and in some cases hydrofluoric acid. Either of these methods is right in the right place. The object of cleaning is to remove the sand which has been burned fast to the surface of the casting from the mold or core. The thicker the walls of the piece, the more the sand of the walls or core will be fixed or burned fast, due to the higher temperature and the longer influence on the sand. Hence, the larger the piece, the more energetic the abrasion required. In the tumbling barrels the pieces are pushed and struck or rubbed with the energy of their own weight and under certain circumstances these shocks may be increased to the energy of the weight of nearly the whole contents of the barrel. Therefore, it is not possible to use the tumbling barrel for cleaning thin walled and hollow pieces or mixed light and heavy pieces, on account of the fact that they would break one another. Also, we cannot tumble castings which would suffer in ornament and general appearance by losing all their edges and prominent outlines. The fitness of the tumbling barrel for cleaning castings is limited by the dimensions and weight of the castings, as with the increase of the size of the casting the barrel would have to be increased in size, until, even if used successfully, there would be no profit in its operation. Therefore, it may be said that the tumbling process is satisfactory for machine and jobbing work of medium size, the exterior of which does not have to be of extra high grade or fine outline.

For fine ornamental thin castings to which from their nature the sand does not burn very fast, the sand blast method is the best. The small grains of sand propelled by the sand blast remove the burned sand and scale from the casting without hurting the surface materially and without danger of breaking the pieces. The sand blast is not so extensively used in America as it is in Germany. It may be profitable to clean certain lines of jobbing castings with the tumbling barrel, or stove castings with sulphuric acid, and not profitable to clean big pieces 4 or more feet in different dimensions, or pieces of from one-half ton to several tons in weight by tumbling. If the sand burns very fast upon the walls of pieces from 3 to 10 inches in thickness it may be impossible to clean them with the sand blast. With such big pieces the acid cleaning is the only profitable way, and in such cases it is very cheap also. In a foundry producing every size of casting, every system of cleaning is necessary.

It may be said that the best cleaner is a good facing and blacking. Of course this is right, but in some places the sand is not fit for green sand molds and in some places the fuel is not so cheap that molds can be dried profitably, so that under some circumstances it may not be profitable to attempt to peel the castings by means of blacking. I think when I visited some of the most celebrated foundries in the States five years ago I saw a number of cases where the sand blast on one hand and the acid process on the other could have been very profitably installed.

The fact that the pickling system is cheap is not its only advantage. The surface becomes very much softer than in the case of castings cleaned by tumbling, or by the sand blast. Therefore, this process is used in many works where there is a large amount of subsequent machining to be done, as for instance, in the machine tool manufacturing plants. The pickling process will not only spare the tools, save time and wages, but also will avoid the disagreeable dust which is pernicious both to men and machines, that is caused by the cutting tool removing the skin of a casting dur-

ing the cutting operations. A good metallic surface and a soft one too can only be secured by the chemical method of cleaning.

Mr. Leyde's remarks are certainly timely and should be given careful attention by American foundrymen. It is interesting to note that some of the largest foundries in the country have now installed a very large variety of cleaning methods. We know of one which uses sand blast tumbling barrels, regular exhaust tumbling barrels, sand blast cleaning rooms, hand cleaning with pneumatic tools and pickling, and it seems as though some of the large foundries producing a large tonnage would do well if they would make a careful study as to the methods of cleaning the different classes of castings.

A NEW MELTING FURNACE.

A NEW MELTING FURNACE.

Most of the melting furnaces that have been thus far developed for the use of oil have been stationary furnaces which simply melted the metal so that it could be subsequently poured into ladles and carried to the molds. This necessitated the heating of either the crucibles or molds so that the metal would not become chilled, or the overheating of the metal so that it would not be too cold when it reached the molds. All foundrymen are familiar with the disastrous results to the metal of overheating it, and realizing these facts, the John Porteous Co., of Cincinnati, O., has brought out the new melting furnace which is shown in the accompanying illustration. The illustration shows the furnace as installed in the Model Foundry at St. Louis.

In this furnace the metal is melted and then the furnace is run along the floor past the molds and they are poured direct from the lip of the furnace, thus avoiding the chilling of the metal. At first it was thought that it would be necessary to have a long spout on the furnace, and, in fact, the first furnace constructed had this spout, but later it has been found that it is unnecessary and that equally good work can be done by pouring direct from the lip shown. All classes of brass and bronze have been melted successfully in this furnace, and, in fact, at the Exposition several classes of castings were being made daily. They claim that by using this furnace and pouring according to their method the manufacture of brass castings can in many cases be reduced to a cost of one-half cent per pound. It requires only about twenty minutes to melt a heat and produce metal of sufficient temperature for pouring.

REVIEWS.

Pig Iron in its Commercial Aspects.

The Iron and Coal Trades Review, Sept. 23, has an abstract of an elaborate paper on the above subject by Mr. F. M. Thomas, read before the Birmingham Metallurgical Society. As it deals very much with English conditions, only a few points are given here. The typical analysis of pig iron for malleable castings is silicon 0.50 to 1.30, manganese 0.25 to 0.35, phosphorus 0.05, sulphur 0.08 to 0.25, and total carbon 3.5 to 3.7. It will be seen that they have our silicon range; less manganese than we; very much less phosphorus; more sulphur, and the same total carbon.

The grading question is worrying them over in England also, and doubt is expressed as to the possibility of ever grading and numbering iron according to analysis. Unfortunately they are not figuring on eliminating the fracture appearance completely, as great stress is laid upon the physical structure of the pig iron, which is so much influenced by the rate of cooling. We are learning to cut this out altogether, and simply going by the composition, let the iron look as it may on fracture, provided it is made properly and gives strong castings for the proper composition. When England gets a Pig Iron Committee to adjust the relations between the founder and the furnaceman on the composition of pig irons, they will come to where we are today.

It seems that pig irons made in various ways command various prices in England. Thus "cinder" pig iron costs 25 to 50 cents a ton less than "part-mine;" while this again costs $3.75 less than "all-mine" pig iron. Over here we do not tell the founder how the furnace was charged, and often bad results come from the indiscriminate use of cinder in the burden.

In the discussion of the paper, Prof. Sexton commented on the grading of iron, quoting the various ores used at present, and hoping that analysis would eventually supplant the present fracture method. Machine cast pig iron, he held, did not find its way into the foundry in increasing quantity, as the founder will not use it. Things are getting different here in that respect. Prof. Turner also discussed the paper, mentioning white iron as well adapted to resisting acids. Mr. Buchanan extolled the virtues of machine cast pig iron and advised that the furnaces making foundry pig iron adopt a mixing ladle so that their casts come out more uniform. Mr. Thomas emphasized the fact that furnace managers would not guarantee the analysis of their irons, and that therefore it was so difficult to talk grading by analysis. If the mixing ladle, however, were generally introduced, this trouble would be obviated, and there would be a long stride taken in the proper direction in both the selling of iron and its use. In speaking of acid-resisting cast iron, it was necessary to have it very close grained; whether this was due to phosphorus or not, did not matter so much. White iron was very close grained, and therefore much used for the purpose.

Some Causes for Unsound Castings.

Giesserei-Zeitung, July 1, et seq. J. Hesse claims that there are many causes for unsound castings, such as badly refined material, evolution of gas at the moment of set, as well as during the melt, imperfect venting, wet cores and molds, etc. In regard to the evolution of gas in a heat, this may be caused in three ways: Oxygen may be dissolved directly from the surrounding medium, in fact, many metals are able to dissolve their own oxides. Where this is the case, oftentimes precautions can be taken to remove the trouble by suitable admixtures. Next, gases may be dissolved under conditions of pressure and temperature existing in a bath of metal, which on changing during the pour release them to the detriment of the castings. Lastly, it is possible for some metals to give off gases while being poured, as the result of a chemical reaction within the bath.

Silver, for instance, is capable of absorbing twenty times its volume of oxygen from the air, without being oxidized at all. This gas comes off at the moment of set, often with explosive violence. Copper absorbs sulphurous acid gas from the fuel, and slowly gives it off again while cooling. The phenomenon of "rising" of copper while in the crucible or in the gates is due to the gases coming off reluctantly, taking the copper up with them. Carbon oxide and hydrogen also have affinity for copper which makes considerable trouble on occasion.

In general, we may say that the capacity of a bath for absorbing gases increases as the pressure in the interior of the furnace increases, as the purity of the metal is greater, as the melting point is higher, and finally as it is overheated to a greater extent.

The alloys of copper naturally have the same troubles to contend against. In the case of the brasses and bronzes, therefore, a little lead is usually added just before pouring. It is supposed that a little of the lead being volatilized, the gases go with it, and again in the oxidation of the lead by uniting with the oxygen present, this element is removed. Only about 0.3 to 0.4 percent of lead should be used. Where the work is very delicate, and strength is necessary in the thinner parts, this addition should be reduced to 0.15 percent. Below this quantity the effect is hardly noticeable in any case.

Copper-tin bronzes show the oxidation of both of these metals, the oxides readily dissolving in the bath. Here phosphorus is the best deoxidizer. Care should be taken to add just enough to accomplish this object, and not to leave a surplus, as this is a detriment. Manganese is now also extensively used, but while it has some advantages, the greater cost leaves the phosphorus method ahead. Then also, the phosphorus alloy can be poured easier and with less loss.

Nickel also has this trouble of gas absorption. Carbonic oxide is taken up in the bath, and given off at the moment of set, leaving the castings porous. Nickel also dissolves its oxide. Magnesium appears to be a good deoxidizer, here, and can also be used for the German silver alloys.

A practical furnace which would melt an alloy or metal without contact with the gases, would be quite a boon to metallurgy.

Foundry Fever.

Deutsche Medecin. Wochenschrift, April 7, discusses the poisoning of molders by the fumes of the brass furnace. The disease engendered is called "foundry fever," and investigation shows that fully 75 percent of all brass molders are subject to it, many having had 20 to 30 spells in their time. The symptoms are an irritation tending to coughing fits, accompanied with headaches and ague. After several hours of this, a strong sweat comes on and the spell is over.

The only cure seems to be the removal of the cause. In one of the foundries badly affected, the raising of the roof to make the working room more airy and commodious, and this, connected with a high stack to remove the vapors, put an end to the trouble at once.

A New Method of Avoiding Shrinkage Spots in Steel Casting.

Eisen-Zeitung, Sept. 23. Dr. A. Neuburger gets over this difficult point by an electrical method. He sends a current through a specially prepared resistance, which makes this mass so hot that when it is placed over a feeder it heats up the metal so that feeding is kept up long after this stop in the ordinary way. Without following the argument as given in the article, it is sufficient to mention that for best results a mass called "kryptol" is used. This consists of a mixture of graphite, carborundum and clay, and is gotten into a granular shape, so that it can be heaped up on a layer of clay, and the current passed through it, or else put into a receptacle and carried about, being placed on mold after mold as required, and kept hot continuously. The mixture has the advantage of not melting below 5,000 degrees F. and can be put at any desired temperature by simply regulating the current. The action is practically the formation of a large number of minute arcs between the granules, which serves to get the whole mass incandescent and capable of sending out a powerful heat.

The steel founder will see at once the great importance of this device, as it enables him to put his metal successively into mold after mold, thus doing away with the waits to feed up, and at the same time cool the metal in the ladle. Without doubt the foundry can also profit by this, for current is now available in nearly every foundry of any size.

We are promised more on this subject as soon as the process has been developed sufficiently to get out of the works it is now used at.

Adam Pyle has put up a new pattern shop at Muskegon Heights, Wis. About six men will be employed.

The Cambria Foundry & Machine Co., Johnstown, Pa., has made an assignment to J. Earl Ogle. This step, which is said to have been taken by the agreement of practically all persons concerned, will not interfere with the operations of the plant. The liabilities are said to be about $20,000.

The Electric Controller & Supply Co., of Cleveland, O., has been awarded a gold medal at St. Louis for its apparatus, which includes a full line of controllers for cranes, charging machines, and similar devices, also magnetic friction and stop brakes, and other devices manufactured by the company.

ASSOCIATIONS AND SOCIETIES.

New England Foundrymen's Association.

Fred F. Stockwell, Secretary, care of Barbour-Stockwell Co., Cambridgeport, Mass.

The regular monthly meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, on Wednesday, Nov. 9, B. M. Shaw, president, presiding.

John Magee, W. B. Snow and A. L. Lovejoy, the committee to prepare an expression on the death of Mr. Archer Brown, of New York, presented the following, which was unanimously adopted:

"The sudden and untimely death of Archer Brown has removed from our midst a much beloved friend and fellow member, whose genial disposition, courtecus manner and hearty fellowship endeared him to all with whom he came in contact.

"We, the New England Foundrymen's Association, in convention assembled, express our deep regrets and record our high appreciation of the sterling qualities of his character and his unusual efficiency in his chosen line of business, which made and retained for him so many friends, endearing him to us and leaving with us pleasant memories of his life.

"In his death this association has sustained the loss of a valuable friend and its members individually an associate whose friendship was prized among the choicest of their business acquaintances.

"We extend to his family our deepest sympathy in their great affliction and our condolence in this their season of grief.

"It is ordered that these resolutions be spread upon the official minutes of this association and that a copy be sent to the widow of our departed friend."

The president then introduced Herbert E. Field, of Pittsburg, who addressed the meeting on the "Chemistry of Cast Iron." At the conclusion of the address the meeting adjourned to dinner.

An announcement was made at the evening session that the executive committee had decided to extend an invitation to the Philadelphia and Pittsburg associations to join with this association in its annual meeting, full particulars of which will be given later.

The speaker of the evening, Dr. Richard Moldenke, secretary of the American Foundrymen's Association, was then introduced and gave a very interesting address on "Chemistry in the Foundry."

Following the address a rising vote of thanks was extended to the speakers. This was made unanimous.

Pittsburg Foundrymen's Association.

F. H. Zimmers, Secretary, care Union Foundry & Machine Co.

Three interesting papers were read at the monthly meeting of the Pittsburg Foundrymen's Association held at Pittsburg, Monday, Nov. 7. Eliot A. Kebler, resident manager of Matthew, Addy & Co., gave "Notes on Southern Iron," which was followed by the reading of a paper by S. H. Stupakoff on the "Pyrometer in Blast Furnace Practice." J. F. Brown, foundry superintendent of the Mesta Machine Co., described a new test bar which he had been successfully using and which created much interest.

Mr. Kebler's paper resulted in considerable discussion, he having brought out some points with reference to Southern iron that were unknown to many of the foundrymen present. S. D. Sleeth, of the Westinghouse Air Brake Co., said that they are using Southern iron extensively and have used about 100,000 tons in the last twelve years. Throughout his experience he said that the lowest phosphorus content of the iron was .82 and the highest 2.50 percent. Too much phosphorus in the iron creates spongy places in the castings, he said, and it is owing to this high percentage of phosphorus that many cannot use it successfully. After making his first purchase of Southern iron the agent told him not to become frightened when the iron was delivered in the yard, explaining that its appearance would be against it. The pig iron agent's hopes were more than realized, pigs from the same car showing varied fractures. Tests made later, however, showed that while the fractures differed the iron was of uniform analysis, and since that time it has been used extensively in their work. It was further explained that Southern grades of foundry iron more often run too high in silicon than too low, and the point was made that foundrymen place entirely too much dependence on the silicon content, when the amount of total carbon should be considered first. While the average total carbon of Southern grades ranges from 3 to 3.5 percent, the Northern grades of iron run from 3.7 to 4 percent and higher. A high phosphorus iron with low total carbon, it was explained, will not pick up as much carbon in passing through the bed of the cupola as an iron low in phosphorus, the latter taking up almost as much carbon in passing through the cupola bed as is lost. It was added that too much silicon in iron has a tendency to harden the castings, very soft castings having been made with the silicon as low as .8, while the carbon was up to 4.60. Mr. Kebler exhibited a number of samples of Southern iron, one piece containing 50 percent of silicon.

In the discussion on S. H. Stupakoff's paper on the pyrometer it was stated that no instru-

ment had yet been devised for measuring the temperature of molten metals, and the hope was expressed that some instrument would be offered whereby the foundrymen could measure the temperature of iron in ladles. Herbert E. Field, metallurgist, of Mackintosh, Hemphill & Co., said that in conducting tests to ascertain the relative merits of the blower and fan for the foundry, he used the LeChatelier pyrometer successfully in ascertaining the temperature of molten iron in ladles. The thermo-couple in addition to being enclosed in a tube was further protected to guard against accident, and the temperature of the iron in ladles on two different days was correctly ascertained.

At the December meeting of the association the committee appointed to investigate the relative merits of the blower and fan for foundry purposes will make its report. The tests were at the plant of Mackintosh, Hemphill & Co., and were exhaustive. At the business session Arthur A. Hamerschlag, director of the Carnegie Trade School of Pittsburg, was elected an honorary member.

Chicago Foundry Foremen.

David Spence, Dist. Vice Pres., 142 Bunker St.

The Chicago Foundry Foremen held their monthly meeting on Nov. 18th. It was their annual election of officers, and the following were chosen: Mr. A. M. Thompson, of the Link Belt Foundry, president; Mr. C. Kleinfielder, of the Allis-Chalmers Co.'s Gates Works, vice president; Mr. Eugene Smith, of the Crane Co., treasurer; Mr. Geo. C. Nielsen, secretary; Mr. E. J. Welsh, of A. Bolter's Sons, sergeant-at-arms. The new charter from the National Association was shown to the members, and it was voted to have all join the National Association.

The paper of the evening was on the Syracuse dry core compound, and was prepared by Mr. C. E. Mills, of the C. E. Mills Oil Co., of Syracuse, N. Y. The paper was very interesting, indeed, showing as it did the value of the Syracuse dry core compound when compared with flour or any other similar compound. The paper was discussed at length and those who had used the compound reported good work from it. Mr. Spence exhibited a core made for the occasion, and explained that he had used asphaltum for the binder. He claimed that cores made with this material for a binder would not show as great a tendency to blow as those made with any ordinary binder.

Cleveland Foundry Foremen.

W. H. Nicholls, 608 Gordon Avenue, District Vice President.

The regular monthly meeting was held on Saturday evening, Nov. 5. After the reading of the minutes of the previous meeting, and the transaction of the other business, which included the election to membership of several new members, a general discussion upon foundry practice was entered into.

Mr. Hugh Mackenzie, of the American Ship Building Co.'s foundry, described an experience which he had recently had in filling some hollow crane posts with cast iron. These were for the cranes on a package freight steamer and were wrought iron tubes 30 ft. long, enclosed at one end. The tubes were about 6 in. in diameter and in order to stiffen them the captain of the boat desired to have them filled solid with cast iron. They did not have a pit deep enough, and as a consequence they had to be bedded in at an angle. In order to prevent springing they were rammed up as tight as possible, and a runner formed at the upper end of each. When the pouring commenced, trouble began, on account of the fact that the pipe expanded and shoved the runner back, causing a run out, and some quick work was necessary to get the pipe filled without trouble. By ramming up the sand hard about it, they had no trouble in keeping the pipe straight, though they used quite a large quantity of weights on top of the pipes to make sure that they stayed in place. A number of other points of foundry practice were discussed before adjournment.

Milwaukee Foundry Foremen.

Thomas Glasscock, Dist. Vice Pres., care Pawling & Harnischfeger Co., Milwaukee, Wis.

The regular monthly meeting was held on Nov. 7. Mr. Beck, superintendent of the Brand Stove Co., read a paper on the manufacture of stove castings and considerable discussion followed. Mr. Marshall, superintendent of the Smith Steel Casting Co., is to read a paper at the next meeting, on Dec. 5.

The constitution was amended so as to admit assistant foremen as members, also so as to increase the territory from which membership could be drawn to a radius of fifty miles from Milwaukee, thus allowing foremen in nearby towns to become members of the association. It was decided to hold a banquet on Monday evening, Nov. 21.

Philadelphia Foundry Foremen.

The second meeting of the Philadelphia Foundry Foremen was held at the Manufacturers' Club Nov. 16th. The following permanent officers were elected. President, A. T. William, of Enterprise Mfg. Co., Philadelphia, Pa.; Vice President, James B. Strain, of Robt. Wetherill & Co., Chester, Pa.; Treasurer, George M. Benkert of Williamson Bros. Co., Philadelphia, Pa.; Secretary, W. P. Cunningham, of American Bridge Co., Pencoyd, Pa.

The following trustees were elected: W. O. Steele, of Bateman Mfg. Co., Grenloch, N. J., for one year. H. W. Kramer, of Thos. Devlin Mfg. Co., Philadelphia, Pa., for 18 months. Adam Pugh, of I. A. Sheppard & Co., Philadelphia, Pa., for two years.

A resolution was introduced changing the by-laws to make three grades of membership, active, associate and honorary. The next monthly meeting will be held at the Manufacturer's Club, on Wednesday, December 21st. The secretary was ordered to provide the necessary printed stationery, letter heads, envelopes, receipts, etc. The meeting adjourned without further business.

PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.
Howard Evans, Secretary, care of J. W. Paxson Co.

THE ASSOCIATED FOUNDRY FOREMEN.
Frank C. Everitt, Secretary, 2413 Third Ave., New York, N. Y., care The J. L. Mott Iron Works.

NEW YORK FOUNDRY FOREMEN.
S. M. Williams, Dist. Vice Pres., 221 Third St., Elizabethport, N. J.

ERIE FOUNDRY FOREMEN.
W. F. Grunau, Dist. Vice Pres., care Erie City Iron Works.

INDIANAPOLIS FOUNDRY FOREMEN.
W. H. Holmes, Dist. Vice Pres., care American Foundry Co.

THE CINCINNATI CONVENTION OF THE NATIONAL FOUNDRYMEN'S ASSOCIATION.

The eighth annual convention of the National Founders' Association was held in Cincinnati, Nov. 16 and 17. The alumni of the administrative council, that is, the past officers and members of the council, together with the present officers and members, held the alumni dinner of the Association on the previous evening. The business transacted at the Cincinnati meeting will undoubtedly be of interest to all foundrymen. The most important action was the decision of the association to withdraw from the "New York Agreement," accompanying this action with a new statement of policy. Below we publish the New York agreement, which was made between the National Founders' Association and the Iron Molders' Union in 1899. The new statement of policy fully explains the present position of the association.

Mr. Antonio C. Pessano, of Detroit, president of the Great Lakes Engineering Works, was elected president; Mr. C. Bermingham, of Kingston, Ont., managing director of the Canadian Locomotive Works, vice president, and the Detroit Savings Bank, of Detroit, was re-elected treasurer. Mr. F. W. Hutchings was made secretary. The administrative council unanimously chose Commissioner Briggs to succeed himself, and Mr. A. E. McClintock, of Detroit, who has been secretary, was made vice-commissioner.

New York Agreement.

WHEREAS, The experience of the members of the National Founders' Association and the Iron Molders' Union of North America justifies them in the opinion that any arrangement entered into that will conduce to the greater harmony of their relation as employers and employes, will be to their mutual advantage; therefore, be it

Resolved, That this committee of conference endorse the principle of arbitration in the settlement of trade disputes, and recommend the same for adoption by the members of the National Founders' Association and the Iron Molders' Union of North America, on the following lines:

That in the event of a dispute arising between members of the respective organizations, a reasonable effort shall be made by the parties directly at interest to effect a satisfactory adjustment of the difficulty; failing to do which, either party shall have the right to ask its reference to a committee of arbitration which shall consist of the presidents of the National Founders' Association and the Iron Molders' Union of North America, or their representatives and two other representatives from each association appointed by the respective presidents.

The finding of this committee of arbitration, by a majority vote, shall be considered final in so far as the future action of the respective organizations is concerned.

Pending adjudication by the committee on arbitration there shall be no cessation of work at the instance of either party to the dispute.

The committee of arbitration shall meet within two weeks after reference of the dispute to them.

The New Policy Stated.

Before passing to our detailed report of the Cincinnati meeting we give below the text of the important declaration it adopted, embodying the reasons for withdrawing from the New York agreement and outlining the policy to be followed by the members of the N. F. A.:

Policy of the National Founders' Association, Outlined by the Convention of 1904.

The National Founders' Association, having exhausted every effort during the period of its existence to formulate a uniform agreement with the molders employed in the foundries embraced in its membership, which foundries are accustomed to make agreements with the molders, hereby makes formal announcement to its members of a policy which they are now requested to pursue in the conduct of their foundries, said policy being intended to put into practice equitable conditions, the principal features of which are as follows:

Limitation of Output.

Arbitrary limitations of output on the part of the molders, or arbitrary demands for an excessive amount of output by the molders on the part of the foundrymen, being contrary to the spirit of equity which should govern the relationship of employer and employe, all attempts in that direction by either party, the molder or foundryman, are to be viewed with disfavor and will not receive the sanction of this association.

Limitation of Earning Capacity.

Inasmuch as certain practices insisted upon by labor organizations tend toward counteracting the energy, ability, inclination and opportunity of molders to earn greater compensation than they are now receiving, it shall continue to be the policy of this association not to permit the limitation of a man's earning capacity, whether he is working by the day, by the piece or premium system, thus protecting our workmen in a desire to improve their conditions.

Fines and Restrictions.

Believing the action of labor organizations in inflicting upon their members fines and punishments for accepting opportunities of advancement and increased earnings offered by the foundrymen is a practice tending toward a deterioration of the ability of the individual workman, this association hereby reaffirms its determination to prevent the imposition of fines and restrictions placed on a molder for the purpose of handicapping him or retarding him in any way from putting forth his best efforts to produce the best quality and quantity of work in the shortest time and receiving a proportionate compensation.

Method of Employment.

Employes will be paid by the hourly rate, by premium system, piece work or contract, as the employers may elect, and the workman so employed will be required to give a fair day's work for a fair day's pay.

Relations of Employes.

Every workman who elects to work in the foundry of a member of this association will be required to work peaceably and harmoniously with his fellow employes and to such a workman the freedom of employment shall not be denied.

Freedom of Employment.

It is the privilege of the employe to leave our employ whenever he sees fit, and it is the privilege of the employer to discharge any workman when he sees fit.

Apprentices.

The number of apprentices, helpers and handy men to be employed will be determined solely by the requirements of the employer.

Appliances.

It shall be the right of the foundryman to introduce molding machines and appliances of any kind and to have the same operated by whomsoever he finds to his best advantage to employ thereon.

Strikes and Lockouts.

Disapproving absolutely of strikes and lockouts, the members of this association will not arbitrate any question with men on a strike. Neither will this association countenance a lockout on any arbitrable question unless arbitration has failed.

Arbitration.

The above principles being absolutely essential to the successful conduct of our business, they are not subject to arbitration.

In case of disagreement concerning matters not covered by the foregoing announcement, we advise our members to meet their employes either individually or collectively and

endeavor to adjust the difficulty on a fair and equitable basis.

Method of Arbitration.

In case of inability to reach a satisfactory adjustment we recommend that the question be submitted to a board of arbitration consisting of two of the employes and two persons engaged in the management of the firm or corporation involved and in case they fail to reach a satisfactory agreement within seven working days, a fifth member shall be chosen by these four and the majority report of the board so constituted shall be final and binding.

In order to receive the benefits of arbitration the employe or employes must continue in the service and under the orders of the employer pending a conference and decision.

In case any member refuses to comply with this recommendation within thirty days after the dispute arises, he shall be denied the support of this association unless it shall approve the action of said member.

Wages.

Employers shall be free to employ foundry operatives at such wages as may be mutually agreed upon, said rates to be governed by local or shop conditions.

In the operation of piece work, premium plan or contract system now in force or to be extended or established in the future, this association will not countenance any conditions of wages which are not just or which will not allow a workman of average efficiency to earn at least a fair wage.

Arbitration Resolution.

In connection with the adoption of the above outline of policy the convention reaffirmed its adherence to the broad principle of arbitration between employer and employe in these terms:

WHEREAS, It has become necessary to withdraw from the provisions of the New York agreement for the reasons announced in the declaration adopted by this convention, and

WHEREAS, The outline of policy adopted by this convention provides means for the settlement of differences which may arise between our members and their employes upon subjects other than those which we believe to be and have announced as indisputable, be it

Resolved, That we hereby announce our continued belief in the principle of arbitration and our disapproval of strikes and lockouts and instruct our officers and administrative council to favor arbitration with our employes either singly or collectively whenever and wherever it will enable them to establish and maintain just and equitable relations between our members and their employes.

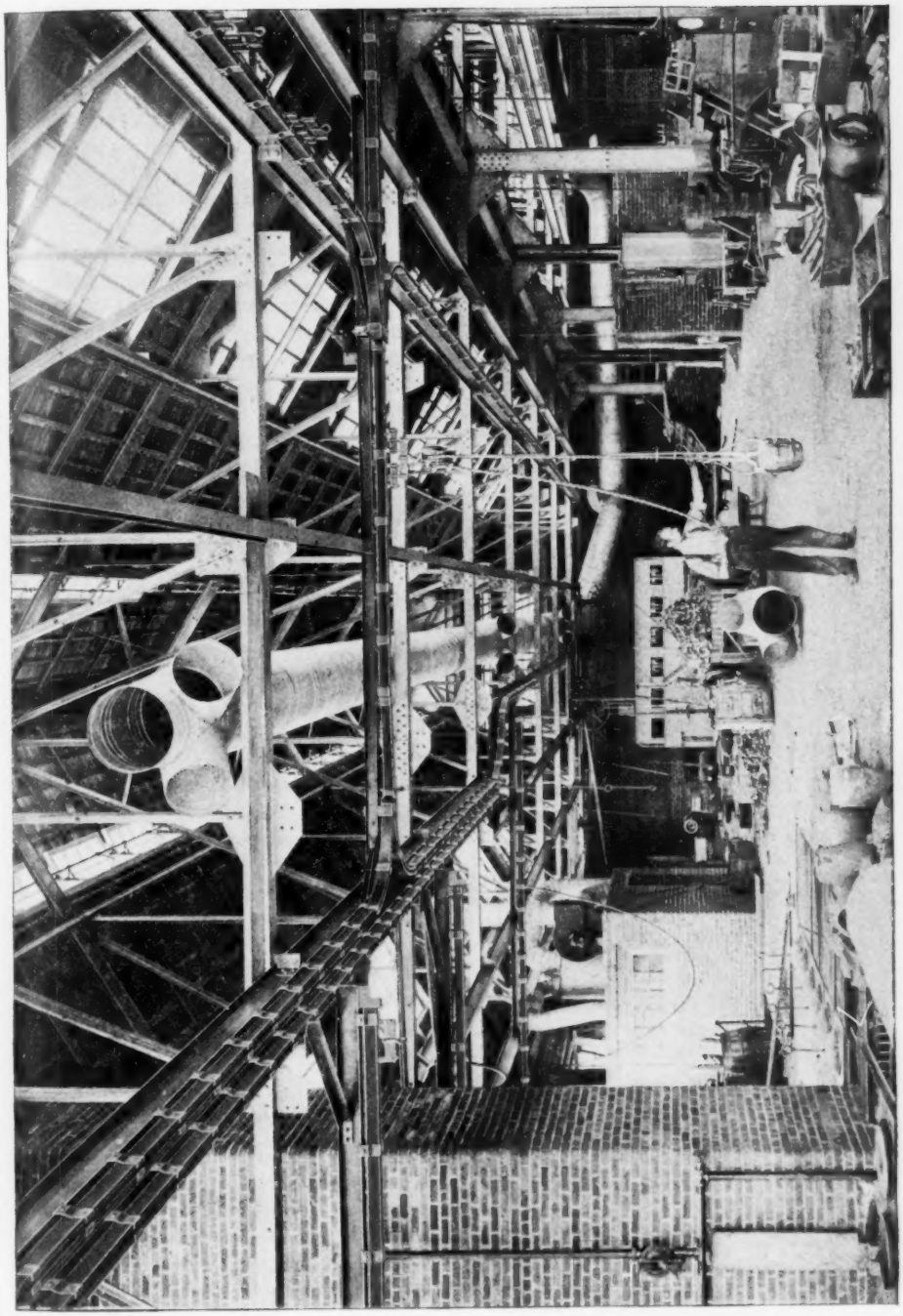
OVERHEAD TRACK FOR FOUNDRIES.

The expeditious carrying and pouring of molten metal in the foundry is one of the points of economy on which emphasis should be laid in the equipment of a modern foundry.

A system devised by the Wilcox Mfg. Co., of Aurora, Ill., secures the rapid handling of metal by means of ladles suspended from roller bearing carriers running on an overhead track system. This track is formed from sheet steel which is bent to the desired form by the use of special and powerful machinery. There is an opening in the lower part of the track through which the pendant for carrying the load passes. The steel is bent inward at the bottom so as to form a flat tread or base for the wheel. This base is about ¾ in. wide, and the manufacturers claim that this flat tread has a great advantage, on account of the fact that it gives a broad bearing to the wheels, reduces wear and eliminates friction. The track is attached to any kind of overhead supports or structure by means of forged steel brackets. No cast iron is used, as all the parts, including the carriers and switches, are made from steel.

One of the accompanying illustrations shows the installation of these carriers in the foundry of the Lunkenheimer Co., at Cincinnati, O., and also shows the switch arrangement by means of which the carriers can be transferred from one track to another. The same illustration shows one of the carriers having 8 wheels and designed so that it can run around curves and at the same time carry heavy loads with a minimum amount of friction.

By a proper system of tracks and switches it is practical to cover the entire floor of the foundry by such a system as this, and it has one advantage over a traveling crane for pouring, on account of the fact that a continuous line of ladles can leave the cupola on one side and by suitable switches pass to the points in the floor where the metal is required. As soon as any given ladle is emptied it passes by another switch from the department which it has been serving to the return track—in other words, the tracks to and from the cupola are never blocked by ladles in the act of pouring, as is the case with a traveling crane system. Ladles carrying as much as 500 pounds of iron



OVERHEAD TRACK FOR FOUNDRIES.

can be handled successfully by this system, and where bull ladles are used to feed the small hand ladles 1,500 to 2,000 pounds may be carried.

The Pott & Bastine foundry, Pottsville, Pa., was destroyed by fire Nov. 21. Loss $6,000

PERSONALS.

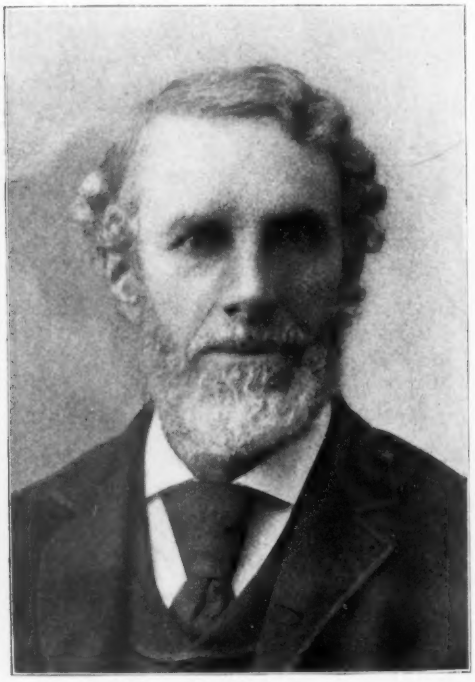
William Waddle, formerly paymaster of the Bellefonte Furnace Co., Bellefonte, Pa., has been elected secretary and treasurer of the Nittany Iron Co., of that city.

William Shoemaker, general superintendent

of construction work for the Nova Scotia Steel Co. blast furnaces, has resigned. He will leave soon for Pennsylvania.

Mr. J. A. Walker, vice president of the Jos. Dixon Crucible Co., has just returned from a month's trip abroad. The trip was a purely business one, but nevertheless, Mr. Walker reports that he was able to get in some interesting sight seeing.

The Smooth-On Mfg. Co., of Jersey City, N. J., has issued a small catalogue 4 x 6½ inches, in which it describes and illustrates



JOHN A. MOORE.

various uses of the Smooth-On products, including the various classes of Smooth-On cement and packing materials. This little book should be in the hands of all engineers in charge of plants or construction work.

DEATHS.

John A. Moore, aged 82 years, well known as a foundryman and president of Moore's Facing Works, Providence, R. I., died Oct. 15, after a protracted illness. He was born in England in 1822 and came to this country 20 years later. He was for many years connected with the development of coal mines and later established Moore's Facing Works, which became well known to all foundrymen east of the Mississippi.

TRADE PUBLICATIONS.

The A. S. Cameron Steam Pump Works, of New York City, have just issued a very neat catalogue 3¼ x 5½ in. This is a reduced edition of a portion of their larger catalogue, and is one of the best examples of a small catalogue which we have seen for a long time. It is bound in paper finished to represent quarter sawed oak, with the Cameron trade mark in the center of the front cover, and an acorn in the center of the back cover, thus making a very artistic appearance. The interior of the catalogue is as pleasing as its exterior, as it contains simply a short statement of the different types of machines, together with facts and figures which should be of interest to any steam pump user.

The Jos. Dixon Crucible Co., of Jersey City, N. J., has issued a new publication entitled "Graphite Lubricants," in which it describes various classes of graphite lubricants, including greases charged with graphite.

The Riverside Metal Refining Co., of Connellsville, Pa., has gotten out a new publication called "The Ingot." This is after the manner of the Obermayer "Bulletin," Crandall & Woodison's "Blast," and Ryerson's "Monthly," and similar trade publications. It is intended to give hints to users of alloys and at the same time to advertise the publishers. It is an 8-page paper, nearly six pages of which are devoted to matter of interest to the readers. We wish the company success in this venture.

The Mt. Carbon Co., of Fowellton, W. Va., has issued a very neat little catalogue 3½ x 6 inches, describing the Powellton foundry coke.

FIRES.

The foundry department of the T. B. Laycock Co., which forms a part of its furniture factory, at Indianapolis, Ind., was damaged by fire to the extent of $1,500 on Oct. 18. Fortunately the foundry was ahead of the rest of the work, so the fire will not hinder operations seriously.

The foundry of the Wheland Foundry Co., of Chattanooga, Tenn., was slightly damaged by fire on Nov. 3. Fortunately, by the quick action of the fire department, the blaze was extinguished without serious damage.

The machine shop and foundry of E. D.

Jones & Co., Pittsfield, Mass., were damaged by fire Oct. 23.

Mellert's Foundry, of Reading, Pa., was visited by fire on Sept. 20th. The fire broke out in the morning, either just under or in the pattern shop, and spread so rapidly that it was soon almost beyond control. Some of the workmen were cut off from the stairways and had to jump from the second story. The fire was fortunately gotten under control, however, before the entire plant was destroyed. The damage will amount to at least $5,000, which is covered by insurance. The foundry was only slightly damaged and will be able to resume work shortly. The pattern shop was entirely destroyed, but fortunately the only patterns lost were those which were then being constructed.

Frank Runser, formerly manager of the Mahoning Foundry & Machine Co., has secured interests in the Forsythe Pattern Co., of Youngstown, O., formerly held by Mr. Forsythe. Mr. Forsythe has been in poor health for several months and has purchased a farm in Maryland, where he intends to reside and devote himself to agricultural pursuits for the present.

Fire destroyed the plant of the Watson-Stillman Co., manufacturer of hydraulic machinery, Aldene, N. J., Nov. 7. Only the iron frame work of the buildings is left standing. The loss is estimated at $65,000. There were 225 employes in the plant. The blaze started in the blacksmith shop from some unknown cause and rapidly spread to the rest of the works.

The plant of the Emmons-Borden Foundry & Machine shop, Trenton, N. J., was burned Nov. 13. Loss $10,000.

The plant of the Brown-Corliss Engine Co., at Corliss, Wis., was damaged by fire on Nov. 8, to the extent of $30,000 or $40,000. It was the foundry which suffered most, but owing to the fact that the cupola and some other parts were not destroyed they will be able to rebuild quite quickly and the balance of the works was only shut down for one day. Repairs are going on rapidly and they expect to have the entire plant in operation again before long.

Fire at the plant of the Friction Pulley & Machine Co., Sandy Hill, N. Y., Nov. 11, practically ruined the company's patterns and pattern room. Loss is $15,000.

The foundries of the Day-Ward Co., Warren, O., manufacturer of bath tubs, lavatories, enameled sinks and kindred articles, were destroyed by fire Nov. 17, entailing a loss of between $25,000 and $30,000. The rebuilding of the plant has been begun.

The Central Malleable Iron Works, of Decatur, Ill., was burned on Nov. 15, causing a loss of $35,000. It took very hard and efficient work on the part of the firemen to prevent a general conflagration of the other works in that vicinity.

The foundry of Filer & Stowell, Milwaukee, Wis., was damaged by fire to the extent of $600 on Nov. 14.

NEW CONSTRUCTION.

Improvements and repairs are fast being completed at the plant of the Perkins Machine Co., Warren, Mass. The foundry will be connected with the machine shop, and the 20-ton electric crane will be operated in both departments. The company has a number of orders on hand from the French and German governments which will insure the operation of the plant throughout the winter.

Peter McConochie, proprietor of the Union Foundry, Machine & Boiler Works, at Lower Slatington, Pa., has torn down his old plant and is building a new one, so that he may enlarge his business.

The Carbondale Machine Co., Carbondale, Pa., will erect shops at Simpson, Pa., as the business of the company has outgrown its Carbondale plant.

The York Foundry & Machine Co., which is affiliated with the York Safe & Lock Co., of York, Pa., are constructing a new pattern storage house 100 x 60 feet.

The Peerless Motor Car Co., Cleveland, O., has let the contract for its new foundry, which will be constructed by the Van Dorn Iron Works Co. It will be 110 ft. long and 50 ft. wide.

The Delphos Foundry Co., Delphos, O., has nearly completed its new plant, which will be in operation in December. It will employ 50 men.

The Wohrle Stove Foundry Co., at West Newark, O., has just started work on another large building. The company already has 15 acres under roof in its plant.

Workmen are now engaged in placing the finishing touches on the new annealing room of the Malleable Iron Works, Marion, Ind. The annealing room is 60 percent larger than the former department and is equipped with new and improved machinery.

The Crane Co., Chicago, will erect a $100,000 office building at the northwest corner of Canal street and Twelfth place. The structure will be 93 x 100 ft., four stories. It is the intention of the company to move all its offices in Chicago to the new building.

The Wheland Machine Works, Chattanooga, Tenn., have just completed extensive additions to the plant, which now covers 16 acres. The improvements consist of a foundry 110 x 210, blacksmith shop 45 x105 ft., an annex to the machine shop 30 x 45 ft., and a complete power plant. The foundry building is a brick and steel structure, absolutely fireproof. In this building are three electric traveling cranes—one large and two small. The blacksmith shop has been equipped with an 800-pound steam hammer and other requirements to make it an up to date shop.

H. E. Thompson, of Louisville, Ky., is constructing a galvanized iron works plant 85 x 170, and a foundry 180 x85 ft.

The Red Jacket Pump Co., Davenport, Ia., has let the contracts for the construction of its new plant, which will cost $35,000 and will include a foundry 100 x 200 ft., machine shop 80 x 200 ft., and several smaller buildings.

The American Graphophone Co., Bridgeport, Conn., will erect a new foundry and japanning plant, 65 x 200 feet.

The Rock River Mfg. Co., Dixon, Ill., will build an addition to its foundry which will double the present capacity. The business has been increasing rapidly.

At a meeting of the stockholders of the Burns Boiler & Mfg. Co., of De Pere, Wis., recently, it was decided to make quite an extensive addition to the foundry.

J. V. Wallace, of North Wilkesboro, N. C., is building a new machine shop and foundry.

The Golden Foundry & Machine Co., Columbus, Ga., is about to make extensive additions to its plant. The machine shop and foundry will be enlarged and considerable new equipment will be installed.

The Southern Steel Works, Chattanooga, Tenn., are erecting an additional building, 70 x 120 ft., which will be made the foundry proper.

Gross Bros., proprietors of the Gross Iron Works, of Eugene, Ore., have purchased a lot 300 ft. square adjoining their plant and will build a new plant. The main building will be about 100 ft. square, two stories, and the remainder of the ground will be covered by smaller buildings.

The Green Foundry & Furnace Co., Des Moines, Ia., has just concluded the purchase of property necessary to carrying out the plans for doubling the capacity of the plant. The improvements will represent an outlay of about $30,000. The company expects to have the improvements completed by Jan. 1.

Messrs. Holmgreen, of San Antonio, Texas, are planning to make an addition to their foundry in the near future, expending from $5,000 to $10,000 on improvements.

Work has been commenced on the new building for the Oklahoma Iron Works & Foundry Co., Guthrie, Okla.

GENERAL INDUSTRIAL NOTES.

S. Everett Sprout, manager of the Seaboard Steel Casting Co., and Richard Peters Jr., secretary of the Consolidated Steel Casting Co., have been appointed appraisers for the Delaware River Steel Casting Co., Chester, Pa., which is in the hands of receivers.

W. M. Brewer, president of the Colonial Foundry & Machinery Co., South Norwalk, Conn., has purchased an interest in the H. A. Tuttle Mfg. Co., Stamford, Conn., and the machinery has been moved to South Norwalk. Gasoline engines, reverse gears, tapping machines and some other specialties will be manufactured.

Taylor & Co., proprietors of one of the largest iron foundries in Greater New York, have moved from their old plant at Driggs avenue and North Twelfth street to their new place at Morgan avenue near Norman, Greenpoint. The change was celebrated by the employes, who converted the day into one of festivities. After forming in a body in the old shop they paraded to the new place, which they christened by casting four immense iron plates. Zachariah Taylor, the senior member of the firm, was presented with two beautiful floral pieces. The large cast iron plates will be used for flooring around the cupola. The new building is 100 x 200 ft. and 50 ft. high.

The C. W. Hunt Co., of West New Brighton, New York, has been particularly successful at the World's Fair, two of its three exhibits securing highest awards, the third not entered. The Hunt "Industrial" Railway received the gold medal for narrow gauge railways, and the electric storage battery locomotive built by that company received the silver medal, being the highest award for this type of locomotive.

The Globe Machine Works and the Penn Foundry and Machine Co., of Frankford, Philadelphia, Pa., have been consolidated and will carry on business under the firm name of

the Globe Machine & Foundry Co. The firm is composed of Charles Denn, William A. Denn, Walter G. Denn, and Jas. Gonley.

The stockholders of the Trimblin Engine & Foundry Co. have decided to accept the offer made by the residents of Avonmore, Pa., by which offer the company is to receive a building site and the citizens are to subscribe for $10,000 worth of stock. In accepting this the company agrees to locate its plant at this point.

The employes of the Pennsylvania R. R. Co. have tested one of the new cupolas in the foundry at South Altoona, and on Oct. 17 they started up a fire in the cupola, ran off a heat and made a number of souvenir castings.

The Clinton Foundry & Machine Co., Nazareth, Pa., has been incorporated with a capital of $30,000.

The Bernville Foundry & Machine Shops, Bernville, Pa., have been sold to William J. Harpel. The machine shop is three stories, 40 x 60 ft., with a foundry one story, 30 x 60 ft.

The S. Obermayer Co., of Cincinnati, O., manufacturer of foundry facings and foundry supplies, has received the highest award and gold medal at the St. Louis Exposition, on plumbago, foundry facings, and foundry supplies of all kinds.

Stockholders of the City Foundry of Lorain, O., have filed a petition asking that the company be declared insolvent. The company was organized in June, 1903.

The Insurance Stove & Range Co., of Cincinnati, O., is making additions and improvements to its foundry and has installed one Newton patent cupola and a traveling crane made by the Northern Engineering Works.

The Vincennes Foundry & Machine Co., Vincennes, Ind., is the name of a new concern that will supplant the Clark & Buck Foundry of that city. The old foundry has been improved and will be equipped with considerable new machinery.

Broderick & Quinlan, who will build a boiler plant at Hartford City, Ind., are considering the advisability of erecting a foundry in connection with that plant. The boiler plant is being built under contract with the Commercial Club of that city. The following directors have been elected: A. R. Weiler, William L. Van Cleve, G. P. Ayres, W. H. Campbell, H. O. Thomas, T. P. Van Winkle, Pierre J. D. Larmoyeux, T. W. Sharpe, J. F. Adamson, Stephen Borden, R. K. Willman, James Fulton and E. E. Cox.

Henry F. Bullerman has purchased the interests of the Bercot Brothers in the Central Foundry Co., Ft. Wayne, Ind., and all the stock is now owned by Mr. Bullerman and William C. Walda. It is their intention to reorganize and double the capital stock in the near future.

The foundry in connection with the shops of the Washington Tool Co., Owatonna, Minn., has been leased by W. J. Felton and G. J. Kaplan, and it is announced that the Washington Tool Co. will open its shops this week.

The Virginia Foundry & Machine Co., of Virginia, Minn., has been incorporated with a capital of $25,000, to carry on a general machine shop and foundry business.

James A. McDaniel, proprietor of the Buckeye Foundry, St. Paul, Minn., will not rebuild the foundry which was destroyed by fire some time ago, but will carry on his business in connection with the Charles A. Stickney foundry, where he will do his work for a year at least.

P. A. & P. E. Dutcher Co., Milwaukee, Wis., has completed a new foundry for the manufacture of steel castings. The company is receiving estimates on the erection of the new open-hearth furnace for steel castings which will be added to the present plant.

The Montgomery Iron Works, Montgomery, Minn., have been sold to the New Prague Foundry Co., of New Prague Minn., and are now being moved to that city.

The Midland Iron Works, of Racine, Wis., have been absorbed by the Stowell Mfg. & Foundry Co., of South Milwaukee, Wis.

The new shops of the Hilles & Jones Co., Wilmington, Del., have been completed and are now in use. They occupy the site of the old malleable iron plant.

Ground has been broken at Bessemer, Ala., for the erection of a plant for the manufacture of stoves, which will be owned and operated by J. R. Day. The capacity of the plant will be 100 stoves per day.

Springer & Lister, machinists and foundrymen, have begun the erection of a large plant at Knoxville, Tenn. About 50 men will be employed.

The Bacon & Collins Supply Co. has secured a building site at Albany, Ga., and will begin the erection of a $25,000 foundry and machine shop at once.

The Retail Merchants' Association of Nashville, Tenn., has made arrangements by which the American Skein and Foundry Co. will build a foundry at Nashville.

The Hubard Foundry & Machine Works, of Lynchburg, Va., has been incorporated with a capital of $20,000. The incorporators are: P. C. Hubard, president; C. W. Gooch, vice president; A. R. Dabney, secretary and treasurer, all of Lynchburg.

The W. J. Oliver Co. has established a plant in Knoxville, Tenn., to be known as the W. J. Oliver Mfg. Co. The plant consists of foundry and machine shops, to manufacture railroad contractors' outfits. The plant has just been equipped through the Birmingham agency of the S. Obermayer Co., of Cincinnati, O.

The new office building of the Wheeling Mold and Foundry Co., of Wheeling, W. Va., has been completed and is now equipped and occupied by the office force. The old office was burned some time ago and the office force has been compelled to occupy temporary quarters for some time. The new building is as near fire proof as it can be made.

The steel foundry of the Virginia Iron, Coal & Coke Co., of Middlesboro, is being dismantled and moved to Max Meadows, Va., where it will be put into operation, with additions. This plant was erected 12 years ago and was considered one of the finest steel casting plants in the South, but it has never been in operation.

The Clinton Iron Works, Clinton, Tenn., has let the contract to build a new foundry building which the company expects to have in operation within 60 days. The officers are: C. J. Sawyer, president; Arville Taylor, vice president; W. L. Owen, secretary and treasurer; A. E. Radert, assistant secretary and treasurer; and C. H. Johnson, general manager.

The Chamber of Commerce of Spokane, Wash., is considering a proposition to establish a plant in that city for the manufacture of harvesters, threshing machines, gasoline engines, grain drills, disk harrows, cultivators and harvesting supplies. The new concern is the Modern Mfg. Co., incorporated with a capital of $175,000, of which over $100,000 has already been subscribed. The principal stockholders are: C. J. Bowers, of Walla Walla; L. L. Young, of Ritzville; W. F. York and L. R. Mack, of Spokane. The plant will require 15 acres for a site, which will probably be donated by the city.

The Phœnix Foundry & Machine Co., of Springfield, Mo., has been incorporated with a capital of $10,000. The incorporators are: George H. McCann, George J. McCann, A. D. Schmook, John Schmook and Anna M. Schmook.

A new foundry and machine shop has been started at Perryville, Mo., of which Wm. Popp is president, John Bishop secretary and treasurer, and Clem Baronowsky is manager.

The foundry plant of the Anaconda Copper Mining Co., of Anaconda, Mont., is being improved and enlarged. These works were formerly known as the Tuttle works.

The United States Foundry & Sales Co., South Norwalk, Conn., has completed the addition to its foundry and core room and has also established a patternmaking department.

In the annual report of Rear Admiral Manney, chief of the department of equipment, he recommends that the machine shop and foundry known as building 39, at the Boston Navy Yard, be extended and the old part fireproofed at a cost of $205,000. He also asks for a new wire rope factory to be erected at the yard at a cost of $110,000.

The Bridgeport Malleable Iron Co., Bridgeport, Conn., which recently filed a certificate with the Secretary of State of Connecticut, providing for an increase of capital to $4,000,000, took the step to enable the working out of ideas along progressive lines. The company is not ready to announce details of its plans. The officers of the company are: William A. Grippin, president; Harris Whittemore, vice president; William J. Grippin, treasurer; Henry Atwater, secretary.

Rogers, Brown & Co., of New York City, announce that Mr. E. L. Billingslea, Mr. J. K. Pollock and Mr. W. T. Shepard, have been admitted to their firm. These gentlemen have been employed by Rogers, Brown & Co. for a number of years, and are well known to the foundry trade.

The new iron and steel foundry of the American Bridge Co., at Ambridge, Pa., is now in full operation. The iron foundry contains one 14-ton cupola and they expect to add another of the same capacity soon. The steel foundry contains one 15-ton open-hearth furnace, and they expect to install another.

The foundry business at Glenville, Pa., formerly carried on by S. R. Miller and G. M. Beard, has been changed, Mr. Miller going out of the partnership and Mr. Beard continuing the business in the same place.

J. H. Schurtz, president and general manager of the National Valve Works, Sandusky, O., has sold his interest to J. F. Williams, of that city, who takes charge of the plant. The company expects to have additional capital and enlarge the business.

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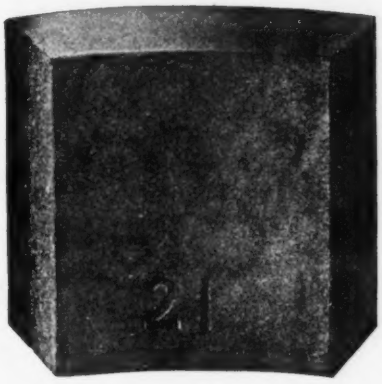

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WANTED.—Situation as superintendent or general foreman of foundry, by a young man with fifteen years' experience in dry and green sand. A practical car wheel man; temperate habits and married. Will invest $5,000 to $10,000 if the opening is satisfactory. Address Box 335, THE FOUNDRY, CLEVELAND, OHIO.

WANTED.—Superintendent capable of taking entire charge of manufactory, making stoves and heaters and employing 300 men. Must be of good executive ability and well versed in up-to-date methods. State age, experience, references and salary expected. Address Box 356, Care THE FOUNDRY, CLEVELAND, OHIO.

FOR SALE.—Machine shop and foundry with patterns. Centrally located. Traveling crane. First-class machinery; foundry capacity 50,000 pounds per week; can be increased 50% at slight expense. The only jobbing foundry here. Population 32,000. Large manufacturing center. Address for particulars CHAS. E. THOMAS, WOONSOCKET, R. I.

WANTED.—Practical young foundryman willing to enter into a copartnership with a bright, energetic, up-to-date young business man, who has had many years' experience in both foundry and office. A thorough investigation as to character and capabilities given and required. This means business. Address Lock Box 11, THE FOUNDRY, 1164 Monadnock Block, CHICAGO.

WANTED.—Superintendent or general foreman for our molding departments, one who has had thorough experience with molding machines, stove plate and water heater molders; also practical cupola man, and one with good executive ability. State experience, salary expected and references. No applications considered except from an A No. 1 foundryman with practical experience. Address "A," Box 336, THE FOUNDRY, CLEVELAND, OHIO.

PLUMBAGO, German, East Indian, Ceylon. Highest grades, lowest prices. BERG MINING CO., NEW YORK.

FOUNDRY FOREMAN.—Man to take charge of new foundry, 250 x 100 feet, of the very latest and best construction, in city of 25,000 people. Must be man who thoroughly understands the management of foundry and knows what a man should do for a day's work and see that it is done. One who is systematic, can handle men properly and generally assume charge of first-class, up-to-date foundry. Must have had A-1 experience. State experience, salary expected and age, and give complete outlines of past work. Address Box 355, Care THE FOUNDRY, CLEVELAND, OHIO.